Tox

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National Environmental Trust

Toxic Power

What the Toxics Release Inventory Tells Us about Power Plant Pollution

By National Environmental Trust for Clear the Air, the National Campaign Against Dirty Power

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Executive Summary

Newly released EPA information on toxic air emissions shows that electric utilities are the biggest polluters in the US – far outstripping industries such as chemical manufacturing and refining. Utilities claim that their toxic releases – while large in the aggregate – pose no threat to the public. However, neither the electric utilities nor EPA have examined potential long-term risk to children, the elderly, and people with respiratory illnesses. Both EPA and the electric utility industry have also failed to analyze the impact of power plant toxic chemical emissions on particulate pollution, an enormous public health concern.

The Toxic Release Inventory, or TRI, is our nation's premiere database of information on how much toxic air, water and land pollution is released each year by various industries. A serious gap in this compendium was recently closed when, after years of resistance, coal- and oil-burning electric utilities were finally forced to disclose their air, land and water pollution. When EPA released the newest data to the public in May 2000, electric utilities instantly became known as the biggest toxic air polluters in the U.S.

This report is the first in-depth analysis of the quantity and nature of coal- and oil-burning power plant toxic pollution brought to light in the Toxic Release Inventory. It demonstrates that electric utility emissions can and do in fact present serious public health concerns. It also shows that special pollution exemptions for power plants have contributed to the massive quantity of toxic materials released by the electric power industry.

Recommendations

The TRI data reveal that the electric power industry is by far the largest aggregate source of some of our most harmful toxic air pollution. Reducing this enormous source of toxic pollution will require a combination of closing special loopholes that exempt electric utilities from pollution controls that apply to other industries, modernizing our current fleet of power plants, and investing in cleaner power sources. Some of the measures that should be taken are as follow:

- The EPA is in the midst of evaluating whether to regulate toxic air pollution from electric power generation. EPA's decision is expected in December 2000. This analysis shows that the EPA needs to strictly regulate electric utility toxic air

Introduction

1998 marked the first year that electric utilities were required to report to U.S. EPA's Toxics Release Inventory, or TRI. Since 1987 industrial facilities engaged in manufacturing have been required to report to TRI their annual releases to the environment and off-site transfers of waste on a chemical-specific basis. Since the first reports, TRI has been expanded to include more activities, industries, and substances. In 1991, TRI was expanded to require data for amounts of on-site recycling, energy recovery, and treatment activities at facilities. In 1995, the number of substances reportable to TRI nearly doubled. Finally, in 1997, EPA expanded the types of facilities required to report to TRI to include electric utilities burning coal or fuel oil, among other new sources such as mining.

Although it is a reporting program and does not set emissions limits, TRI has been responsible for huge reductions in emissions from industrial facilities. Simply having to report the data and subsequently having those data made public has caused facilities to examine their processes and reduce releases to the environment.[1] From 1988, the year EPA uses as its TRI baseline, reported releases to air, water, and land, and injections into deep wells have decreased by nearly 50 percent among the manufacturing sector facilities that report to TRI.[2] For many companies, assembling their 1987 TRI numbers was a big surprise – they had never examined their emissions as a whole, and the totals were extremely high. And, of course, the numbers were a surprise to communities and citizens' groups that had never previously had access to the information.

The numbers have turned out to be no less surprising for the 613 coal- and oil-burning electric power plants reporting to TRI for 1998. ***Nationwide, electric utilities ranked number one for air emissions in the TRI data, and number two for total TRI releases in 1998***.

Even before the TRI toxic air pollution data became available, electric power plants were known to be the largest industrial source of air pollutants such as smog-forming nitrogen oxides, soot-forming sulfur dioxide, and carbon dioxide, a powerful greenhouse gas.[3] The vast majority of this pollution comes from older coal-fired

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[1] For an analysis of TRI's impact on emissions reduction, see A. Fung and D. O'Rourke, "Reinventing Environmental Regulation from the Grassroots U sed

power plants.[4] The TRI data now confirm that these power plants are not only the largest industrial source of conventional air pollutants, but that they are also by far the largest source of toxic air pollution, primarily in the form of acid gases and toxic metals. The magnitude of power plant toxic releases is one more indication that the special interest favoritism that has long exempted utilities from controlling virtually any of their pollution must end.

This report examines nationwide and state TRI electric utility data for 1998. It shows the quantity and nature of toxic pollutants reported by power plants, and describes the potential health damage they can cause. It also suggests ways in which the massive amount of toxic power plant pollution can be reduced. The numerous data tables at the end of the report reveal how much toxic pollution electric utilities emit compared to other industries, rank the top-polluting utility holding companies, and list by amount the nearly 60 toxic chemicals released by power plants to the environment. The data tables also contain state-by-state information on electric utility toxic releases, including how the electric power industry compares to other top polluting industries in each state, and the quantity of toxic pollution released by each power plant in all 50 states.

[4] Among power plants, older coal-fired facilities produce the most pollution. Fifty-six percent of power plant boilers in operation in the U.S. are fueled by coal. However, they account for over 93

National TRI Data on Electric Power Plants

How much toxic air pollution did electric utilities report for 1998?

Electric utilities reported releasing nearly **784 million tons** of chemicals to the air in 1998, and reported over **one billion pounds** of total releases to air, water, and land (see **Table 1**). Nationally, electric utilities ranked number one for industrial toxic air emissions in 1998, and number two for total TRI toxic releases, behind the metal mining industry.[5]

What are the top electric utilities or utility holding companies for TRI releases?

Southern Company, American Electric Power (AEP), and Tennessee Valley Authority (TVA) ranked first, second, and third for total TRI releases in 1998 for the utility industry (see **Table 2**). These companies also ranked first, second, and third for air emissions.[6] Southern Company reported releasing over 114 million pounds of TRI chemicals to the environment in 1998 from 24 power plants, and was responsible for over 10 percent of TRI emissions from the entire utility industry.[7]

What chemicals did electric utilities report to TRI?

The 613 power plants reporting to TRI for 1998 reported releasing an average of seven chemicals each to the air, although the industry as a whole reported air emissions of 61 different substances, and other releases of an additional two substances (See **Table 3**).

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[5] Facilities report their industry to TRI by means of Standard Industrial Classification (SIC) codes. A facility may report more than one SIC code to TRI, although the first SIC code reported is supposed to represent the major activity of the facility. This report uses the primary SIC code as the designation for the entire facility.

[6] For a listing of conventional air pollution (NOx, SO2, CO2 and mercury) releases by holding company, see *Lethal Legacy, The Dirty Truth About the Nation's Most Polluting Power Plants*. Available online at http://www.cleartheair.org.

[7] Although power plants report the names of their parent companies to TRI, they do not always report their ultimate parent company, especially when the electric utility that owns the plant is a subsidiary of a holding company. In addition, facilities reporting the same parent companies may use slight variations in name that don't allow the data for a parent company to be easily integrated (for example, "The Southern Company" as opposed to "Southern Company," or using initials or abbreviations). For these reasons, this report links TRI data with other data available from U.S. EPA and U.S. DOE and other data sources to determine the proper parent companies for those plants that could be matched among databases. Given the lag between data reporting and data availability, these parent company or holding company designations may not represent the current status as to number of plants and total emissions.

The top three chemicals released as reported by electric utilities – **hydrochloric acid**, **sulfuric acid**, and **hydrofluoric acid** (also known as hydrogen fluoride), accounted for **98 percent of electric utility TRI air emissions** in 1998. Releases

- Several substances released by power plants are also neurotoxins that damage the nervous system, such as manganese compounds and n-hexane, and reproductive and developmental toxins, such as toluene and lead compounds.

- In addition to health effects for individual chemicals, power plant aerosol and metal emissions also contribute to secondary particulate pollution.[12] Emissions of acids and metals coalesce into small droplets and particles that are of particular concern for public health. As many as 45,000 people per year are estimated to die because of exposure to fine particle pollution.[13]

Appendix 3 lists health impacts associated with some of the key toxic pollutants released by power plants. The table in Appendix 3 does not imply that exposure automatically equals health effects, but demonstrates why these substances are cause for concern.

Where do the chemicals released by power plants come from?

Impurities present in coal and fuel oil are released to the environment when these fuels are burned by power plants. Although coal is mostly carbon, it also contains a small percentage by weight of sulfur compounds, compounds containing chlorine and fluorine, and various metals. While some coal is "cleaner" in that it has fewer impurities, all coal and fuel oil contain some impurities that create a variety of chemical substances when the fuel is burned. These substances end up either as air pollutants or are present in the ash left over after fuel combustion. They are also present in soot captured from the exhaust streams of smokestacks equipped with scrubbers or baghouses.

How do power plant releases compare to other plants that generate the same chemicals?

Table 4 compares electric power plant acid emissions to plants in other industries, both plants that manufacture the acids as products, and plants that produce the acids as byproducts and impurities. Electric power plants produce these acids as impurities, and ***the average power plant releases between 27 and 54 times more acid aerosols than the average plant in other industries*** that produce the acids as products, byproducts, or impurities.

For example, just as lumber, bricks and cement are the building blocks of the construction industry, acids are some of the building blocks of the chemical industry

[12] U.S. EPA: *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units –Final Report to Congress*. Volume 2. 453/R-98-004b. February 1998.

[13] Natural Resources Defense Council, "Breathtaking: Premature Mortality Due to Particulate Air Pollution in 239 American Cities," (1996).

and are used to manufacture countless chemicals and materials we use every day. Hydrochloric, hydrofluoric and sulfuric acids are three such building blocks.[14] Plants that produce these acids for sale or distribution released about two-and-a-half million pounds of them to the air in 1998. In contrast, power plants do not produce these acids as products for sale, but merely as byproducts of the combustion of coal and oil – and yet they released more than ***three-quarters of a billion pounds*** of these acids to the air in 1998.

Most facilities in other industries are limited by the Clean Air Act as to the amount of acid aerosols and other chemicals they can release to the environment. So a plant that manufactures hydrofluoric acid will only be allowed to release a few thousand pounds of that chemical per year, even though it may produce tens of millions of pounds of the chemical as product. In contrast, the average electric power plant releases over 175,000 pounds of hydrofluoric acid aerosols each year without a permit.

How do legal loopholes and special exemptions affect toxic emissions from power plants?

The huge amount of toxic air pollution from power plants is at least in part the result of special pollution exemptions for the electric industry that currently exist in the Clean Air Act. They also enjoy an exemption under the Resource Conservation and Recovery Act (RCRA) that allows them to dispose of over 100 million tons of toxic combustion waste annually with no restrictions. While ending these special exemptions for power plants will not, by itself, resolve the massive toxic pollution from electricity generation, it is an important part of the solution. In particular, acid aerosols and toxic metals would be reduced by ending special exemptions for power plants.

Ø Acid aerosol air pollution be reduced by closing the Clean Air Act "grandfather" loophole

Because of a "grandfather" loophole under the Clean Air Act, the vast majority of coal- and oil-fired power plants fail to meet modern pollution standards for sulfur dioxide (SO_2

Some larger power plants are required to control their SO_2 emissions under the acid rain provisions of the Clean Air Act. If these plants did not have SO_2 controls, emissions of hydrochloric acid would have been 25 percent higher.[15] SO_2 controls also reduced nationwide sulfuric acid emissions from power plants by 48 percent, and reduced hydrofluoric acid emissions by 30 percent.[16]

Although SO_2 controls are not present on every power plant and are not designed to capture acid aerosols as efficiently as control systems designed for those chemicals, they certainly reduce the amount of acid aerosols released to air.[17] ***The average coal-fired power plant with complete SO_2 controls releases 95% less***

Mercury is one example of a toxic metal emitted by power plants that has been reduced through the use of controls by other industrial emitters of mercury. Although power plants did not report their mercury emissions to TRI in 1998 (see above), other EPA data confirms that coal-fired electric power plants are far and away the single biggest source of mercury air pollution in the US. They are responsible for 34 percent of the total mercury emitted by all known sources.[20]

Power plants emit almost as much mercury as the next two biggest sources combined - municipal waste incinerators (19 percent) and coal and oil-fired commercial/industrial boilers (18 percent).[21] In stark contrast to coal-burning utilities, the other major sources of mercury pollution are doing – or will soon be doing – their fair share to reduce mercury emissions.

Recently-issued EPA regulations for municipal and medical waste incinerators will require that mercury air pollution be reduced by 90 percent and 94 percent respectively by 2002. The same level of control on power plants should be required. Similar controls should also be required for other toxic metals emitted by power plants. Other toxic metals can be captured to levels exceeding 95 percent and as high as the 99.9 percent by more efficient particulate controls.[22]

Ø Toxic waste contamination of land and water would be reduced by closing the RCRA combustion waste special exemption

Combustion waste is the solid and liquid waste left over from burning coal and oil to make electricity — ash, sludge, boiler slag, mixed together with a dozen or so smaller volume wastes. Every year, over 100 million tons of these wastes are produced at approximately 600 coal and oil-fired power plants. Seventy-six million tons are primarily disposed of at the power plant site in unlined and unmonitored wastewater lagoons, landfills and mines.[23]

These wastes are highly toxic. They contain concentrated levels of contaminants like arsenic, mercury, chromium and cadmium that can damage the nervous systems and other organs, especially in children. Analyses performed for EPA show

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[20] US EPA, Office of Water, *Air Pollution and Water Quality: Atmospheric Deposition Initiative: Where is the air pollution coming from?* Available at http://www.epa.gov/owowwtr1/oceans/airdep/air5.html.

[21] Id.

[22] Brown, T.D.; D.N. Smith, R.A. Hargis, Jr., W.J. O'Dowd. *Mercury Measurement and its Control: What we Know, Have Learned and Need to Further Investigate*. J. Air and Waste Management Assoc., June 1999, pp. 1-97.

[23] For more details on the hazards of toxic combustion waste, see "Laid to Waste: The Dirty Secret of Combustion Waste From America's Power Plants," (March 2000), available on-line at: http://www.cleanair.net/Resources/laidtowaste.htm

that some of these pollutants would eventually migrate and contaminate nearby groundwater. Incredibly, disposal of these toxic wastes is subject to no federal rule whatsoever, having been exempted from EPA rule by the Resource Conservation and Recovery Act (RCRA) for the past 20 years.

In 1998, power plants reported ***over 230 million pounds of six toxic metals*** managed on site, disposed of on site, or shipped off site for management and disposal (see **Table 3**). These toxic metals are primarily contained in the combustion waste. In particular, power plants reported nearly 180 million pounds of barium compounds managed, shipped as waste, or disposed of; as well as over 13 million pounds each of nickel and chromium compounds, nearly 10 million pounds of barium, over 8 million pounds of lead compounds, and over 6 million pounds of arsenic compounds.

Contamination of land and groundwater by toxic coal and oil combustion waste would be significantly reduced if EPA were to designate these wastes as "hazardous" under RCRA. Coal and oil power plant combustion wastes require federal regulatory oversight because of the toxicity of their components, the demonstrated and documented danger they pose to public health and the environment. State rules are inadequate to control or mitigate these risks and dangers. The effect of a federal designation of these wastes as hazardous would be significantly tighter controls on disposal of these wastes in landfills and lagoons with modern environmental controls such as liners, groundwater monitoring and leachate collection systems.

What other measures would reduce toxic pollution from power plants?

Even if all existing legal loopholes are closed, there will continue to be massive toxic emissions from power plants. Impurities present in coal and fuel oil, including sulfur compounds, compounds containing chlorine and fluorine, and various metals, will continue to be a source of massive toxic releases so long as these fuels are burned to produce electricity.

Taking just one example, even if the Clean Air Act grandfather loophole is closed and all power plants are required to control their SO_2 emissions, power plants will continue to be an enormous source of toxic sulfuric acid. The four power plants with SO_2 controls analyzed in this report emit nearly ***three million pounds*** of sulfuric acid (see Appendix 2). That means that just four power plants – *with SO_2 controls* – emit ***over four times more*** sulfuric acid than all other industries ***combined*** that actually produce sulfuric acid as a product or byproduct (see **Table 4**). That is because these other industries are forced to have pollution control equipment designed to remove sulfuric acid.

Burning cleaner fuels with fewer impurities – such as natural gas – will help lower power plant toxic emissions. In addition, improving energy efficiency and increasing the amount of electricity generated from renewable sources such as biomass, solar,

wind and geothermal will further reduce the overall toxic releases from the electric industry.

A national market-based **renewable energy portfolio standard (RPS)** that ensures growth in the percentage of electricity generated from renewable sources including biomass, geothermal, solar and wind energy will help achieve this goal. The RPS requires that each electricity producer offer a set amount of renewable energy, either by acquiring renewable generating capacity or by buying surplus renewable capacity from others.

Finally, reducing overall demand for coal- and oil-generated electricity through energy efficiency measures will also reduce toxic emissions from the power industry. This goal can be achieved by making investments in **energy efficiency** through the establishment of a **nationwide public benefits trust fund**. Investment in the trust fund is accomplished by a uniform charge for transmitting electricity over the existing utility grid.

State TRI Data on Electric Power Plants

How do electric utilities rank for emissions within the states compared to other industries?

Electric utilities ranked number one for either 1998 TRI air emissions or total TRI releases in 35 states and territories. Utilities ranked number two for air emissions or total releases in an additional eight states and territories (see **Table 5**). Electric utilities ranked low for emissions in states with small numbers of coal- and oil-fired power plants, such as California, Maine, and Oregon. In states such as Texas and Louisiana, with large chemical and petroleum industries, 1998 power plant emissions were still significant, although not the largest sources of releases. Likewise, in states with significant mining and metals processing, electric utilities ranked below those industries for total releases, although power plants are generally the top sources of air emissions in those states (see **Table 6**).

How do power plant emissions compare among states?

Table 7 compares electric utility emissions in each state for air emissions, total releases (air, water, and land), and average releases per plant. **Ohio** ranks highest

Table 1: 1998 TRI Releases by Industry

Rank

Table 3: 1998 TRI Electric Utility Releases and Production-Related Waste, by Chemical

Rank by Air Emissions	Chemical Name	Air Emissions (pounds)	Total Releases (pounds)	Rank by Total Releases	Production-Related Waste (pounds)	Rank by Production-Related Waste

Table 3: 1998 TRI Electric Utility Releases and Production-Related Waste, by Chemical

Rank by Air Emissions	Chemical Name	Air Emissions (pounds)	Total Releases (pounds)	Rank by Total Releases	Production-Related Waste (pounds)	Rank by Production-Related Waste
35	CHLORINE DIOXIDE	13,000	13,510	42	13,510	47
36	ANTIMONY COMPOUNDS	9,627	841,957	20	947,896	23
37						

Table 3: 1998 TRI Electric Utility Releases and Production-Related Waste, by Chemical

Rank by Air Emissions	Chemical Name	Air Emissions (pounds)	Total Releases (pounds)	Rank by Total Releases	Production-Related Waste (pounds)	Rank by Production-Related Waste
--	CARBONYL SULFIDE	0	0	--	0	--
--	CRESOL (MIXED ISOMERS)	0	0	--	0	--
--	SODIUM DIMETHYLDITHIOCARBAMATE	0	0	--	0	--
--	DIBENZOFURAN	0	0	--	0	--
--	PHENOL	0	0	--	0	--
--	BIPHENYL	0	0	--	0	--
--						

Table 5: Electric Utilities' Rank among Industries by State, 1998 TRI Data

State	Rank by Air Emissions	Rank by Total Releases
Alabama	1	1
Alaska	2	3
Arizona	1	2
Arkansas	8	3
California	14	13
Colorado	1	2
Connecticut	2	2
Delaware	1	1
District of Columbia	1	1
Florida	1	1
Georgia	1	1
Hawaii	1	1
Idaho	--	--
Illinois	1	1
Indiana	1	1
Iowa	2	1
Kansas	1	1
Kentucky	1	1
Louisiana	4	4
Maine	8	8
Maryland	1	1
Massachusetts	1	1
Michigan	1	1
Minnesota	1	1
Mississippi	1	2
Missouri	1	2
Montana	1	1
Nebraska	1	1
Nevada	2	4
New Hampshire	1	1
New Jersey	1	1
New Mexico	2	4
New York	1	1
North Carolina	1	1
North Dakota	1	1
Ohio	1	2
Oklahoma	2	2
Oregon	12	10
Pennsylvania	1	1
Puerto Rico	1	1
Rhode Island	1	1

Table 5: Electric Utilities' Rank among Industries by State, 1998 TRI Data

State	Rank by Air Emissions	Rank by Total Releases
South Carolina	1	2
South Dakota	5	3
Tennessee	2	2
Texas	3	2
Utah	2	4
Vermont	--	--
Virginia	1	1
Washington	7	3
West Virginia	1	1
Wisconsin	1	1
Wyoming	1	1
United States	1	2

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
Alabama			
1	Electric Utilities	28,660,982	45,714,366
2	Paper and Allied Products	19,808,253	25,691,968
3	Chemicals and Allied Products	17,302,849	18,952,104
4	Primary Metal Industries	2,922,052	10,689,587
5	Stone, Clay, Glass, and Concrete Products	2,194,236	2,229,810
6	Fabricated Metal Products	1,760,442	1,978,709
7	Electronic and Other Electric Equipment	1,757,222	1,757,799
8	Transportation Equipment	1,543,112	1,544,921
9	Rubber and Miscellaneous Plastics Products	1,522,789	1,540,083
10	Food and Kindred Products	1,450,147	2,664,249
11	Furniture and Fixtures	1,104,456	1,104,456
12	Lumber and Wood Products, Except Furniture	909,914	912,958
13	Machinery, Except Electrical	505,873	523,316
14	Textile Mill Products	341,281	349,538
15	Petroleum Refining and Related Industries	284,110	334,269
16	National Security and International Affairs	264,513	268,572
17	Other Industries	261,714	263,479
18	Printing, Publishing, and Allied Industries	114,628	114,628
19	Miscellaneous Manufacturing Industries	112,875	113,125
20	Chemical Distributors	25,568	25,568
21	Petroleum Terminals	9,381	9,484
22	Solvent Recyclers	7,572	7,572
23	RCRA Regulated Treatment, Disposal, or Recycling Sites	6,266	12,192,296
24	Instruments and Related Products	295	313
25	Coal Mining, except Extraction Activities	87	1,030,087
Alaska			
1	Chemicals and Allied Products	1,542,451	1,638,085
2	Electric Utilities	567,100	567,100
3	Metal Mining, except Iron Ores and Uranium	511,214	304,495,138
4	Petroleum Refining and Related Industries	235,466	238,388
5	Paper and Allied Products	61,000	61,000
6	Petroleum Terminals	16,962	17,000
7	Chemical Distributors	1,255	1,255
Arizona			
1	Electric Utilities	3,531,238	9,526,350
2	Primary Metal Industries	3,180,493	173,365,862
3	Paper and Allied Products	853,801	984,818
4	Rubber and Miscellaneous Plastics Products	595,067	600,187
5	Transportation Equipment	346,368	346,648
6	Fabricated Metal Products	252,290	252,548
7	Metal Mining, except Iron Ores and Uranium	248,347	882,384,685
8	Electronic and Other Electric Equipment	237,071	371,503

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
9	Miscellaneous Manufacturing Industries	189,621	193,421
10	Stone, Clay, Glass, and Concrete Products	166,587	166,587
11	Food and Kindred Products	137,754	137,759
12	Lumber and Wood Products, Except Furniture	67,088	67,088
13	Chemicals and Allied Products	63,809	66,224
14	Petroleum Terminals	57,387	57,387
15	Furniture and Fixtures	26,927	26,927
16	Printing, Publishing, and Allied Industries	25,478	25,478
17	National Security and International Affairs	16,500	16,500
18	Chemical Distributors	12,249	12,249
19	Machinery, Except Electrical	3,201	4,451
20	Instruments and Related Products	1,825	1,825
21	Petroleum Refining and Related Industries	1,005	1,005
22	Other Industries	1,000	5,471
23	RCRA Regulated Treatment, Disposal, or Recycling Sites	997	997
24	Textile Mill Products	674	674
Arkansas			
1	Chemicals and Allied Products	5,448,452	7,415,167
2	Paper and Allied Products	5,273,392	6,782,722
3	Rubber and Miscellaneous Plastics Products	2,772,372	2,791,157
4	Food and Kindred Products	2,219,831	2,748,843
5	Primary Metal Industries	1,934,271	2,814,925
6	Electronic and Other Electric Equipment	1,930,727	1,942,092
7	Transportation Equipment	1,378,230	1,378,235
8	Electric Utilities	1,248,681	3,312,053
9	Lumber and Wood Products, Except Furniture	1,134,383	1,190,775
10	Fabricated Metal Products	1,028,568	1,047,901
11	Petroleum Refining and Related Industries	804,772	806,566
12	Stone, Clay, Glass, and Concrete Products	536,521	776,860
13	Furniture and Fixtures	525,232	534,810
14	Machinery, Except Electrical	380,648	381,058
15	Instruments and Related Products	183,227	183,747
16	Textile Mill Products	88,826	89,110
17	Other Industries	67,424	67,540
18	Printing, Publishing, and Allied Industries	61,159	61,159
19	Miscellaneous Manufacturing Industries	47,722	56,372
20	Petroleum Terminals	24,216	24,216
21	RCRA Regulated Treatment, Disposal, or Recycling Sites	22,492	45,341
22	Leather and Leather Products	21,232	21,232
23	Chemical Distributors	985	985
California			
1	Petroleum Refining and Related Industries	7,034,534	9,745,237
2	Chemicals and Allied Products	3,205,540	3,710,449
3	Fabricated Metal Products	3,043,172	3,060,978

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
4	Food and Kindred Products	2,966,897	3,435,947
5	Rubber and Miscellaneous Plastics Products	2,807,975	2,808,020
6	Transportation Equipment	2,274,954	2,278,370
7	Stone, Clay, Glass, and Concrete Products	1,413,599	1,587,682
8	Lumber and Wood Products, Except Furniture	729,548	740,913
9	Paper and Allied Products	640,998	1,901,395
10	Printing, Publishing, and Allied Industries	497,240	497,240
11	Primary Metal Industries	488,042	1,033,769
12	Petroleum Terminals	470,307	472,422
13	Electronic and Other Electric Equipment	445,495	446,509
14	Electric Utilities	385,620	532,937
15	Furniture and Fixtures	370,140	370,140
16	Metal Mining, except Iron Ores and Uranium	362,004	8,735,327
17	Miscellaneous Manufacturing Industries	290,082	375,425
18	National Security and International Affairs	187,837	187,985
19	Textile Mill Products	180,289	180,316
20	Chemical Distributors	106,527	106,528
21	Instruments and Related Products	100,184	100,185
22	Machinery, Except Electrical	50,921	

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
23	National Security and International Affairs	0	249
Connecticut			
1	Chemicals and Allied Products	1,664,551	2,100,831
2	Electric Utilities	1,259,018	1,259,057
3	Rubber and Miscellaneous Plastics Products	781,698	781,786
4	Fabricated Metal Products	667,588	750,504
5	Primary Metal Industries	359,577	476,287
6	Textile Mill Products	293,632	293,634
7	Electronic and Other Electric Equipment	236,864	259,412
8	Instruments and Related Products	198,232	198,492
9	Petroleum Terminals	177,468	177,513
10	Transportation Equipment	176,635	203,866
11	Paper and Allied Products	171,417	173,907
12	Machinery, Except Electrical	141,408	141,663
13	Furniture and Fixtures	44,200	44,200
14	Printing, Publishing, and Allied Industries	36,765	36,765
15	Miscellaneous Manufacturing Industries	23,749	23,986
16	Food and Kindred Products	9,212	32,462
17	Chemical Distributors	7,408	7,408
18	Stone, Clay, Glass, and Concrete Products	6,884	6,884
19	Lumber and Wood Products, Except Furniture	500	500
20	Petroleum Refining and Related Industries	250	250
21	RCRA Regulated Treatment, Disposal, or Recycling Sites	0	0
21	Other Industries	0	0
Delaware			
1	Electric Utilities	6,818,633	7,468,952
2	Petroleum Refining and Related Industries	1,580,497	1,919,578
3	Chemicals and Allied Products	1,220,718	1,895,409
4	Transportation Equipment	863,321	863,321
5	Food and Kindred Products	335,200	396,776
6	Textile Mill Products	91,858	91,858

Lumber a

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
District of Columbia			
1	Electric Utilities	66,250	66,250
2	Other Industries	2,700	11,506
3	Printing, Publishing, and Allied Industries	0	0
Florida			
1	Electric Utilities	57,992,319	66,487,509
2	Paper and Allied Products	10,573,593	11,719,283
3	Chemicals and Allied Products	6,817,820	45,558,126
4	Transportation Equipment	3,746,157	3,748,614
5	Rubber and Miscellaneous Plastics Products	3,125,916	3,125,916
6	Fabricated Metal Products	2,851,155	2,851,641
7	Food and Kindred Products	2,747,749	6,844,074
8	Other Industries	348,521	379,594
9	Miscellaneous Manufacturing Industries	316,503	316,503
10	Instruments and Related Products	221,672	221,672
11	Furniture and Fixtures	208,321	208,321
12	Petroleum Terminals	151,682	153,881
13	Primary Metal Industries	114,561	140,405
14	Stone, Clay, Glass, and Concrete Products	108,201	118,981
15	Lumber and Wood Products, Except Furniture	106,572	107,240
16	National Security and International Affairs	103,236	103,236
17	Electronic and Other Electric Equipment	103,218	103,935
18	Printing, Publishing, and Allied Industries	84,180	84,180
19	Chemical Distributors	84,042	84,102
20	Machinery, Except Electrical	29,038	29,038
21	RCRA Regulated Treatment, Disposal, or Recycling Sites	18,103	27,943
22	Leather and Leather Products	9,670	9,670
23	Petroleum Refining and Related Industries	2,071	2,071
24	Textile Mill Products	1,761	1,761
25	Solvent Recyclers	6	6
26	Metal Mining, except Iron Ores and Uranium	0	0
Georgia			
1	Electric Utilities	47,191,872	58,465,758
2	Paper and Allied Products	16,717,701	19,164,367
3	Chemicals and Allied Products	6,037,048	9,189,655
4	Transportation Equipment	5,990,803	6,043,435
5	Stone, Clay, Glass, and Concrete Products	5,242,337	7,450,111
6	Rubber and Miscellaneous Plastics Products	3,254,529	3,264,073
7	Lumber and Wood Products, Except Furniture	1,878,951	1,879,844
8	Food and Kindred Products	1,878,144	1,958,892
9	Fabricated Metal Products	1,590,899	1,596,156
10	Printing, Publishing, and Allied Industries	833,075	833,075
11	Machinery, Except Electrical	742,737	746,259

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
12	Primary Metal Industries	646,939	729,269
13	National Security and International Affairs	372,404	373,061
14	Furniture and Fixtures	371,354	371,354
15	Textile Mill Products	354,969	646,585
16	Electronic and Other Electric Equipment	211,830	227,472
17	Tobacco Manufacturers	172,718	172,718
18	Miscellaneous Manufacturing Industries	111,897	112,131
19	Apparel and Other Finished Fabric Products	69,699	69,699
20	Other Industries	47,498	155,598
21	Instruments and Related Products	44,355	44,355
22	22 22		

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
19	Petroleum Terminals	108,746	110,475
20	Solvent Recyclers	51,735	51,735
21	Chemical Distributors	36,143	36,179
22	RCRA Regulated Treatment, Disposal, or Recycling Sites	30,538	21,811,771
23	Instruments and Related Products	21,625	21,625
24	Metal Mining, except Iron Ores and Uranium	16,521	16,521
25	Other Industries	15,135	15,400
26	Coal Mining, except Extraction Activities	1,780	2,727,616
27	Tobacco Manufacturers	53	53
28	National Security and International Affairs	16	135
29	Apparel and Other Finished Fabric Products	0	0
Indiana			
1	Electric Utilities	44,326,731	61,049,964
2	Primary Metal Industries	10,123,727	26,062,496
3	Rubber and Miscellaneous Plastics Products	9,369,960	9,535,530
4	Transportation Equipment	7,866,202	7,875,967
5	Chemicals and Allied Products	4,925,717	5,889,6 TD .72 0 5,889,6 TD

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
6	Machinery, Except Electrical	1,191,295	1,196,013
7	Fabricated Metal Products	980,430	1,290,607
8	Transportation Equipment	827,727	829,442
9	Primary Metal Industries	707,613	2,344,882
10	Furniture and Fixtures	585,038	585,038
11	Paper and Allied Products	561,999	562,499
12	Miscellaneous Manufacturing Industries	409,950	409,980
13	Lumber and Wood Products, Except Furniture	342,120	342,120
14	Printing, Publishing, and Allied Industries	323,250	323,250
15	Stone, Clay, Glass, and Concrete Products	253,399	356,031
16	Chemical Distributors	13,902	16,121
17	National Security and International Affairs	11,599	11,599
18	Leather and Leather Products	11,105	11,105
19	Other Industries	11,000	15,350
20	Petroleum Terminals	9,935	9,935
21	Instruments and Related Products	8,386	8,386
22	Petroleum Refining and Related Industries	2,277	2,277
23	Solvent Recyclers	10	10
Kansas			
1	Electric Utilities	5,002,491	11,423,885
2	Chemicals and Allied Products	4,984,846	6,811,501
3	Transportation Equipment	4,047,178	4,097,925
4	Petroleum Refining and Related Industries	2,380,771	2,401,675
5	Food and Kindred Products	1,592,179	1,710,961
6	Stone, Clay, Glass, and Concrete Products	1,329,548	1,519,813
7	Paper and Allied Products	1,058,489	1,062,789
8	Fabricated Metal Products	978,484	997,057
9	Machinery, Except Electrical	895,473	896,74812

23978,484

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
1	Electric Utilities	44,786,767	58,320,131
2	Chemicals and Allied Products	10,011,414	10,462,683
3	Rubber and Miscellaneous Plastics Products	4,982,859	5,023,737
4	Transportation Equipment	4,495,395	4,620,209
5	Paper and Allied Products	2,871,736	3,498,700
6	Primary Metal Industries	2,186,278	4,319,234
7	Printing, Publishing, and Allied Industries	1,172,438	1,172,438
8	Electronic and Other Electric Equipment	1,053,462	1,057,065
9	Food and Kindred Products	950,213	950,223
10	Fabricated Metal Products	936,106	958,100
11	Petroleum Refining and Related Industries	576,720	622,907
12	Machinery, Except Electrical	390,830	391,808
13	Stone, Clay, Glass, and Concrete Products	319,069	764,987
14			

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
18	RCRA Regulated Treatment, Disposal, or Recycling Sites	1,581	4,335,444

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
20	Miscellaneous Manufacturing Industries	1,000	1,000
21	Petroleum Refining and Related Industries	515	515
22	Chemical Distributors	260	260
23	Lumber and Wood Products, Except Furniture	30	30
24	Solvent Recyclers	6	6
25	National Security and International Affairs	2	79,607
Massachusetts			
1	Electric Utilities	5,639,923	5,679,789
2	Chemicals and Allied Products	1,049,820	1,052,607
3	Fabricated Metal Products	809,618	809,761
4	Rubber and Miscellaneous Plastics Products	629,526	630,304
5	Textile Mill Products	618,995	618,995
6	Paper and Allied Products	617,455	618,205
7	Petroleum Terminals	237,434	246,902
8	Electronic and Other Electric Equipment	198,432	245,482
9	Instruments and Related Products	181,416	183,046
10	Leather and Leather Products	167,904	167,904
11	Miscellaneous Manufacturing Industries	135,645	135,655
12	Primary Metal Industries	111,753	111,933
13	Stone, Clay, Glass, and Concrete Products	93,962	93,962
14	Furniture and Fixtures	75,546	75,546
15	Transportation Equipment	44,365	45,898
16	Machinery, Except Electrical	43,448	44,477
17	Printing, Publishing, and Allied Industries	18,693	18,693
18	Chemical Distributors	17,321	17,321
19	RCRA Regulated Treatment, Disposal, or Recycling Sites	4,980	4,985
20	Other Industries	4,626	4,626
21	Food and Kindred Products	200	200
22	Lumber and Wood Products, Except Furniture	30	35
23	Solvent Recyclers	6	6
24	Petroleum Refining and Related Industries	0	0
Michigan			
1	Electric Utilities	33,812,186	43,554,530
2	Transportation Equipment	13,997,378	14,010,076
3	Paper and Allied Products	6,349,972	7,070,366
4	Stone, Clay, Glass, and Concrete Products	4,811,168	5,242,443
5	Chemicals and Allied Products	3,545,319	7,108,776
6	Furniture and Fixtures	2,570,221	2,575,651
7	Rubber and Miscellaneous Plastics Products	2,230,119	2,231,295
8	Lumber and Wood Products, Except Furniture	1,706,714	1,730,364
9	Primary Metal Industries	1,560,787	2,752,411
10	Fabricated Metal Products	1,236,449	1,260,524
11	Food and Kindred Products	1,118,169	1,184,525
12	Machinery, Except Electrical	680,910	680,955

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
6	Petroleum Refining and Related Industries	3,470,264	3,709,467
7	Textile Mill Products	2,218,010	2,292,010
8	Food and Kindred Products	2,207,400	3,161,441
9			

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
Montana			
1	Paper and Allied Products	1,993,585	2,073,510
2	Electric Utilities	950,655	7,780,776
3	Lumber and Wood Products, Except Furniture	860,479	860,479
4	Petroleum Refining and Related Industries	470,604	481,083
5	Primary Metal Industries	415,123	42,534,316
6	Food and Kindred Products	272,100	286,600
7	Metal Mining, except Iron Ores and Uranium	143,173	68,423,630
8	Chemicals and Allied Products	65,242	67,540
9			

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
7	Fabricated Metal Products	23,636	23,636
8	Petroleum Refining and Related Industries	19,615	19,615
9	Lumber and Wood Products, Except Furniture	19,221	19,221
10	Electronic and Other Electric Equipment	17,259	17,259
11	Transportation Equipment	4,705	4,705
12	RCRA Regulated Treatment, Disposal, or Recycling Sites	1,865	1,323,065
13	Machinery, Except Electrical	505	505
14	Chemical Distributors	475	475
15	Food and Kindred Products	259	259
16	Miscellaneous Manufacturing Industries	0	0
New Hampshire			
1	Electric Utilities	4,026,179	4,047,879
2	Paper and Allied Products	883,892	1,078,606
3	Rubber and Miscellaneous Plastics Products	702,589	702,619
4	Fabricated Metal Products	188,559	189,931
5	Primary Metal Industries	121,808	122,396
6	Textile Mill Products	104,109	104,109
7	Electronic and Other Electric Equipment	93,827	94,499
8	Machinery, Except Electrical	52,618	52,618
9	Miscellaneous Manufacturing Industries	43,619	43,619
10	Transportation Equipment	34,223	34,223
11	Leather and Leather Products	26,191	26,191
12	Chemicals and Allied Products	21,155	33,491
13	Printing, Publishing, and Allied Industries	12,858	12,858
14	Instruments and Related Products	11,000	11,005
15	Furniture and Fixtures	1,058	1,058
16	Stone, Clay, Glass, and Concrete Products	1,000	1,000
17	Chemical Distributors	504	504
18	Food and Kindred Products	5	5
19	Lumber and Wood Products, Except Furniture	0	0
New Jersey			
1	Electric Utilities	7,529,062	7,877,531
2	Chemicals and Allied Products	2,636,573	6,719,146
3	Transportation Equipment	1,445,923	1,450,903
4	Primary Metal Industries	1,427,166	1,618,524
5	Petroleum Refining and Related Industries	1,147,731	3,280,354
6	Fabricated Metal Products	1,049,725	1,066,927
7	Paper and Allied Products	447,151	447,151
8	Rubber and Miscellaneous Plastics Products	438,409	454,185
9	Petroleum Terminals	296,064	296,601
10	Printing, Publishing, and Allied Industries	168,427	168,427
11	Stone, Clay, Glass, and Concrete Products	161,478	188,580
12	Chemical Distributors	144,514	144,519
13	Food and Kindred Products	124,310	124,310

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
14	Machinery, Except Electrical	70,819	71,069
15	Textile Mill Products	62,479	62,479
16	Instruments and Related Products	48,164	48,164
17	Electronic and Other Electric Equipment	25,656	28,806
18	Lumber and Wood Products, Except Furniture	21,492	21,492
19	Other Industries	21,467	21,467
20	Solvent Recyclers	18,237	18,237
21			

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
12	Food and Kindred Products	360,910	973,628
13	Machinery, Except Electrical	332,412	333,725
14	Petroleum Terminals	302,039	302,866
15	Transportation Equipment	288,817	454,991
16	Miscellaneous Manufacturing Industries	240,756	246,938
17	Furniture and Fixtures	174,594	174,594
18	Lumber and Wood Products, Except Furniture	114,115	114,231
19	Metal Mining, except Iron Ores and Uranium	65,560	10,144,538
20	Textile Mill Products	37,820	37,820
21	Leather and Leather Products	18,194	18,194
22	Chemical Distributors	16,473	16,473
23	S.eOK004.92 0 TD -0.0232 sy, Except Electrical		

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
2	Food and Kindred Products	1,282,462	1,325,365
3	Petroleum Refining and Related Industries	507,862	510,688
4	Machinery, Except Electrical	251,044	251,101
5	Miscellaneous Manufacturing Industries	134,847	134,847
6	Transportation Equipment	53,553	53,553
7	Rubber and Miscellaneous Plastics Products	25,755	25,755
8	Chemical Distributors	772	772
9	Chemicals and Allied Products	450	450
10	Coal Mining, except Extraction Activities	0	96,707
10	Lumber and Wood Products, Except Furniture	0	0
Ohio			
1	Electric Utilities	95,220,630	109,616,575
2	Chemicals and Allied Products	16,706,014	36,441,027
3	Primary Metal Industries	10,476,440	34,424,919
4	Rubber and Miscellaneous Plastics Products	7,516,207	7,889,976
5	Transportation Equipment	5,747,166	5,759,527
6	Paper and Allied Products	5,716,363	5,820,732
7	Fabricated Metal Products	5,650,222	5,707,006
8	Stone, Clay, Glass, and Concrete Products	3,951,562	4,231,979
9	Food and Kindred Products	2,240,702	2,361,952
10	Textile Mill Products	1,303,650	1,304,193
11	Electronic and Other Electric Equipment	1,101,882	1,104,035
12	Machinery, Except Electrical	1,011,000	1,012,467
13	Petroleum Refining and Related Industries	443,057	545,272
14	Lumber and Wood Products, Except Furniture	425,964	425,964
15	Miscellaneous Manufacturing Industries	373,458	373,458
16	Printing, Publishing, and Allied Industries	362,906	362,906
17	Solvent Recyclers	251,955	251,955
18	Furniture and Fixtures	235,991	235,991
19	Apparel and Other Finished Fabric Products	142,013	142,013
20	Petroleum Terminals	107,538	111,411
21	Chemical Distributors	91,269	91,299
22	Instruments and Related Products	66,994	67,074
23	RCRA Regulated Treatment, Disposal, or Recycling Sites	52,879	53,292,907
24	Other Industries	45,215	268,705
25	Coal Mining, except Extraction Activities	2,390	3,642
Oklahoma			
1	Chemicals and Allied Products	6,435,414	10,406,873
2	Electric Utilities	6,178,303	8,079,268
3	Paper and Allied Products	3,628,613	4,207,648
4	Petroleum Refining and Related Industries	1,638,808	1,717,804
5	Transportation Equipment	1,536,277	1,551,013
6	Fabricated Metal Products	881,255	948,067
7	Rubber and Miscellaneous Plastics Products	710,853	727,827

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
8	Food and Kindred Products	402,944	402,944
9			

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
4	Rubber and Miscellaneous Plastics Products	5,893,783	5,903,287
5	Chemicals and Allied Products	3,808,178	4,052,931
6	Petroleum Refining and Related Industries	2,812,649	3,005,987
7	Fabricated Metal Products	2,468,503	2,607,450
8	Stone, Clay, Glass, and Concrete Products	2,039,489	2,070,243
9	Printing, Publishing, and Allied Industries	1,839,262	1,839,483
10	Lumber and Wood Products, Except Furniture	1,489,010	1,523,762
11	Transportation Equipment	1,382,451	1,383,702
12	Miscellaneous Manufacturing Industries	1,103,777	1,104,527
13	Furniture and Fixtures	641,007	641,007
14	Machinery, Except Electrical	639,201	640,184
15	Electronic and Other Electric Equipment	469,355	485,345
16	Leather and Leather Products	318,527	332,199
17	Petroleum Terminals	216,828	218,995
18	Food and Kindred Products	192,028	291,098
19	Textile Mill Products	153,668	153,668
20	Tobacco Manufacturers	128,500	128,500
21	Instruments and Related Products	106,381	106,602
22	Chemical Distributors	41,652	41,662
23	Coal Mining, except Extraction Activities	36,853	318,563
24	Apparel and Other Finished Fabric Products	30,184	30,184
25	Other Industries	23,006	27,122
26	National Security and International Affairs	8,327	8,450
27	RCRA Regulated Treatment, Disposal, or Recycling Sites	5,410	4,503,220
28	Solvent Recyclers	42	42
Puerto Rico			
1	Electric Utilities	9,857,078	10,073,942
2	Chemicals and Allied Products	3,879,169	3,992,921
3	Petroleum Refining and Related Industries	963,613	981,668
4	Miscellaneous Manufacturing Industries	680,396	680,396
5	Fabricated Metal Products	279,416	279,416
6	Solvent Recyclers	264,929	264,929
7	Instruments and Related Products	74,719	74,719
8	Rubber and Miscellaneous Plastics Products	51,445	58,045
9	Leather and Leather Products	34,717	34,717
10	Electronic and Other Electric Equipment	33,608	33,613
11	Food and Kindred Products	26,516	26,516
12	Petroleum Terminals	21,796	21,796
13	Furniture and Fixtures	19,239	19,239
14	Machinery, Except Electrical	17,200	17,200
15	Chemical Distributors	13,851	24,640
16	Other Industries	9,766	9,766
17	Textile Mill Products	4,950	4,950
18	Primary Metal Industries	2,337	2,355
19	Stone, Clay, Glass, and Concrete Products	2,314	2,314
20	Tobacco Manufacturers	542	543

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
21	Lumber and Wood Products, Except Furniture	0	0
21	Transportation Equipment	0	0
Rhode Island			
1	Electric Utilities	455,002	455,007
2	Printing, Publishing, and Allied Industries	420,934	420,959
3	Rubber and Miscellaneous Plastics Products	213,206	213,206
4	Paper and Allied Products	197,970	197,970
5	Fabricated Metal Products	164,021	164,021
6	Stone, Clay, Glass, and Concrete Products	100,315	100,369
7	Transportation Equipment	89,514	89,627
8	Textile Mill Products	83,007	83,507
9	Chemicals and Allied Products	72,984	74,240
10	Primary Metal Industries	48,132	48,132
11	Petroleum Terminals	48,113	48,469
12	Furniture and Fixtures	14,000	14,00012

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Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
20	Metal Mining, except Iron Ores and Uranium	24,000	23,017,000
21	Chemical Distributors	12,990	14,483
22	Solvent Recyclers	4,716	4,716
23	National Security and International Affairs	1,500	1,500
24	Petroleum Refining and Related Industries	402	411
25	Other Industries	0	568
South Dakota			
1	Food and Kindred Products	1,104,253	1,912,134
2	Chemicals and Allied Products	294,026	294,026
3	Machinery, Except Electrical	222,729	236,286
4	Rubber and Miscellaneous Plastics Products	199,201	199,201
5	Electric Utilities	189,732	1,814,788
6	Fabricated Metal Products	150,220	150,220
7	Primary Metal Industries	123,987	123,987
8	Lumber and Wood Products, Except Furniture	120,248	120,428
9	Metal Mining, except Iron Ores and Uranium	85,608	17,147,708
10	Transportation Equipment	70,371	70,371
11	Miscellaneous Manufacturing Industries	20,889	20,889
12	Electronic and Other Electric Equipment	8,251	8,501
13	Instruments and Related Products	265	265
Tennessee			
1	Chemicals and Allied Products	34,985,420	42,869,120
2	Electric Utilities	26,657,215	34,784,135
3	Rubber and Miscellaneous Plastics Products	12,467,737	12,518,628
4	Paper and Allied Products	7,221,843	7,846,896
5	Transportation Equipment	5,398,910	5,400,325
6	Printing, Publishing, and Allied Industries	4,455,199	4,455,219
7	Fabricated Metal Products	2,962,136	3,246,513
8	Primary Metal Industries	2,255,620	2,429,820
9	Food and Kindred Products	1,946,557	1,953,753
10	Furniture and Fixtures	1,596,508	1,627,352
11	Textile Mill Products	1,046,437	1,046,942
12	Electronic and Other Electric Equipment	973,448	979,756
13	Machinery, Except Electrical	794,746	797,478
14	Stone, Clay, Glass, and Concrete Products	535,207	563,511
15	Other Industries	432,217	496,249
16	Miscellaneous Manufacturing Industries	406,376	406,381
17	Lumber and Wood Products, Except Furniture	233,263	233,406
18	Metal Mining, except Iron Ores and Uranium	177,725	10,752,750
19	Petroleum Refining and Related Industries	135,837	137,322
20	Petroleum Terminals	45,312	45,706
21	Chemical Distributors	28,104	28,414
22	Leather and Leather Products	10,158	10,158
23	Solvent Recyclers	7,226	7,226

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
24	Instruments and Related Products	6,257	6,257
25	Tobacco Manufacturers	136	136
26	RCRA Regulated Treatment, Disposal, or Recycling Sites	95	7,134
27	Apparel and Other Finished Fabric Products	12	12
28	National Security and International Affairs	0	0
Texas			
1	Chemicals and Allied Products	60,144,003	182,157,550
2	Petroleum Refining and Related Industries	19,113,234	25,571,325
3	Electric Utilities	8,138,409	33,452,683
4	Paper and Allied Products	6,046,246	7,509,533
5	Rubber and Miscellaneous Plastics Products	4,944,807	4,975,490
6	Primary Metal Industries	3,134,101	5,126,994
7	Fabricated Metal Products	3,106,138	3,112,056
8	Stone, Clay, Glass, and Concrete Products	2,907,246	3,938,799
9	Transportation Equipment	2,877,134	2,880,169
10	Food and Kindred Products	2,446,176	2,894,594
11	Lumber and		

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
11	Furniture and Fixtures	123,632	123,632
12	National Security and International Affairs	122,869	122,869
13	Stone, Clay, Glass, and Concrete Products	68,538	89,988
14	Electronic and Other Electric Equipment	59,446	59,468
15	Miscellaneous Manufacturing Industries	17,424	17,463
16	Food and Kindred Products	9,110	139,438
17	Petroleum Terminals	5,988	5,988
18	Chemical Distributors	4,718	4,718
19	RCRA Regulated Treatment, Disposal, or Recycling Sites	3,237	16,396,906
20	Machinery, Except Electrical	1,630	1,900
21	Printing, Publishing, and Allied Industries	0	250
21	Leather and Leather Products	0	0
Virginia			
1	Electric Utilities	17,440,545	20,525,941
2	Paper and Allied Products	15,598,524	16,548,430
3	Chemicals and Allied Products	9,602,091	10,750,157
4	Rubber and Miscellaneous Plastics Products	4,938,577	4,949,694
5	Transportation Equipment	2,540,105	2,720,134
6	Printing, Publishing, and Allied Industries	2,084,224	2,084,229
7	Tobacco Manufacturers	1,877,785	2,050,075
8	Lumber and Wood Products, Except Furniture	1,578,435	1,578,845
9	Furniture and Fixtures	1,473,117	1,473,307
10	Fabricated Metal Products	1,395,798	2,289,606
11	Stone, Clay, Glass, and Concrete Products	894,455	894,754
12	Primary Metal Industries	759,289	1,373,470
13	Food and Kindred Products	640,887	663,793
14	Miscellaneous Manufacturing Industries	482,568	490,579
15	Petroleum Refining and Related Industries	363,904	432,404
16	Textile Mill Products	341,213	450,645
17	Electronic and Other Electric Equipment	300,810	300,847
18	Machinery, Except Electrical	169,340	169,340
19	Petroleum Terminals	127,367	240,494
20	Instruments and Related Products	108,268	108,268
21	National Security and International Affairs	74,198	74,213
22	Other Industries	73,045	73,045
23	Chemical Distributors	24,597	24,597
24	Solvent Recyclers	4,937	4,937
25	Coal Mining, except Extraction Activities	1,630	1,810
Washington			
1	Paper and Allied Products	8,173,217	11,052,655
2	Primary Metal Industries	5,293,610	5,865,125
3	Transportation Equipment	1,878,579	1,880,438
4	Fabricated Metal Products	1,328,109	1,328,134
5	Chemicals and Allied Products	1,315,596	1,471,752

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
6	Petroleum Refining and Related Industries	1,188,520	1,297,642
7	Electric Utilities	1,139,941	4,505,615
8	Rubber and Miscellaneous Plastics Products	924,976	924,976
9	Lumber and Wood Products, Except Furniture	684,069	684,650
10	Electronic and Other Electric Equipment	132,921	135,576
11	National Security and International Affairs	112,697	122,447
12	Machinery, Except Electrical	107,897	107,897
13	Food and Kindred Products	107,228	217,083
14	Textile Mill Products	97,900	97,900
15	Stone, Clay, Glass, and Concrete Products	87,599	87,599
16	Petroleum Terminals	73,452	80,520
17	Miscellaneous Manufacturing Industries	64,198	64,198
18	Other Industries	48,956	48,956
19	Furniture and Fixtures	28,233	28,983
20	Metal Mining, except Iron Ores and Uranium	27,045	574,070
21			

Table 6: Statewide TRI Emissions by Industry, 1998 Data

Rank by Air Emissions	Industry	Air Emissions (pounds)	Total Releases (pounds)
4	Transportation Equipment	1,862,432	1,862,682
5	Lumber and Wood Products, Except Furniture	1,745,055	1,748,861
6	Rubber and Miscellaneous Plastics Products	1,327,159	1,327,953
7	Machinery, Except Electrical	1,267,750	1,270,759
8	Primary Metal Industries	1,082,738	1,100,737
9	Chemicals and Allied Products	1,057,357	1,058,637
10	Printing, Publishing, and Allied Industries	712,987	712,992
11	Electronic and Other Electric Equipment	619,700	643,703
12	Textile Mill Products	536,003	536,003
13	Leather and Leather Products	450,871	451,178
14	Furniture and Fixtures	419,177	419,177
15	Miscellaneous Manufacturing Industries	301,117	301,132
16	Food and Kindred Products	265,426	1,225,290
17	Apparel and Other Finished Fabric Products	101,152	101,152
18	Stone, Clay, Glass, and Concrete Products	91,512	131,518
19	Other Industries	71,772	73,392
20	Petroleum Refining and Related Industries	55,616	56,009
21	Petroleum Terminals	24,885	24,940
22	RCRA Regulated Treatment, Disposal, or Recycling Sites	22,662	22,662
23	Chemical Distributors	18,594	19,294
24	Instruments and Related Products	6,096	6,106
25	Solvent Recyclers	5,379	5,379
Wyoming			
1	Electric Utilities	2,270,618	12,174,782
2	Petroleum Refining and Related Industries	689,061	720,261
3	Chemicals and Allied Products	530,299	8,187,420
4	Fabricated Metal Products	280,254	280,254
5	Food and Kindred Products	163,486	174,939
6	Other Industries	36,550	40,555
7	Stone, Clay, Glass, and Concrete Products	8,859	8,859
8	Machinery, Except Electrical	329	329
9	Primary Metal Industries	20	20
10	Lumber and Wood Products, Except Furniture	0	0

Table 7: State Rankings for Electric Power Plant Emissions, 1998 TRI Data

State	Air Emissions (pounds)	Total Releases (pounds)	Number of Power Plants Reporting	Average Releases per Plant (pounds)	Rank for Power Plant Air Emissions	Rank for Total Power Plant Releases	Rank for Average Releases per Plant
Alabama	28,660,982	45,714,366	11	4,155,851	11	9	3
Alaska	567,100	567,100	1	567,100	44	46	38
Arizona	3,531,238	9,526,350	6	1,587,725	31	27	19
Arkansas	1,248,681	3,312,053	4	828,013	39	39	35
California	385,620	532,937	16	33,309	46	47	49
Colorado	1,912,616	5,069,056	14	362,075	35	36	44
Connecticut	1,259,018	1,259,057	7	179,865	38	44	46
Delaware	6,818,633	7,468,952	3	2,489,651	24	34	10
District of Columbia	66,250	66,250	1	66,250	49	49	48
Florida	57,992,319	66,487,509	37	1,796,960	4	3	16
Georgia	47,191,872	58,465,758	14	4,176,126	6	6	2
Hawaii	3,133,022	3,133,022	10	313,302	32	40	45
Idaho	0	0	0	--	--	--	--
Illinois	32,126,653	36,919,395	25	1,476,776	10	11	22
Indiana	44,326,731	61,049,964	23	2,654,346	8	5	8
Iowa	8,696,569	12,656,829	18	703,157	21	20	37
Kansas	5,002,491	11,423,885	8	1,427,986	27	23	24
Kentucky	44,786,767	58,320,131	19	3,069,481	7	7	6
Louisiana	4,197,816	8,797,845	4	2,199,461	28	29	12
Maine	43,001	43,001	2	21,501	50	50	50
Maryland	24,749,607	25,026,614	10	2,502,661	13	15	9
Massachusetts	5,639,923	5,679,789	13	436,907	26	35	42
Michigan	33,812,186	43,554,530	24	1,814,772	9	10	14
Minnesota	1,751,834	11,867,980	13	912,922	36	22	33
Mississippi	9,271,476	11,304,718	5	2,260,944	20	24	11
Missouri	12,983,638	32,430,345	18	1,801,686	18	14	15
Montana	950,655	7,780,776	4	1,945,194	42	33	13
Nebraska	4,086,255	7,818,322	7	1,116,903	29	32	29
Nevada	1,151,501	2,235,963	4	558,991	40	41	39
New Hampshire	4,026,179	4,047,879	3	1,349,293	30	38	25
New Jersey	7,529,062	7,877,531	16	492,346	23	31	41
New Mexico	711,363	1,897,520	2	948,760	43	42	32
New York	16,100,588	18,192,033	34	535,060	15	17	40
North Carolina	48,387,026	56,791,632	21	2,704,363	5	8	7
North Dakota	1,404,407	10,155,778	7	1,450,825	37	25	23
Ohio	95,220,630	109,616,575	27	4,059,873	1	1	4
Oklahoma	6,178,303	8,079,268	7	1,154,181	25	30	26
Oregon	127,585	747,590	2	373,795	48	45	43
Pennsylvania	58,857,300	64,730,536	41	1,578,794	3	4	20
Puerto Rico	9,857,078	10,073,942	10	1,007,394	19	26	30

Table 7: State Rankings for Electric Power Plant Emissions, 1998 TRI Data

State	Air Emissions (pounds)	Total Releases (pounds)	Number of ower Plants Reporting	Average Releases per Plant (pounds)	Rank for Power Plant Air Emissions	Rank for Total Power Plant Releases	Rank for Average Releases per Plant

Appendix 1: Electric Utility Releases and Production-Related Waste by State and Power Plant, 1998 TRI Data

	Air Emissions	Total Releaes	Production-Related

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Appendix 1: Electric Utility Releases and Production-Related Waste by State and Power Plant, 1998 TRI Data

	Air Emissions	Total Releaes	Production-Related

Appendix 2: Data and Methodology

TRI Data

Data in this report come from the 1998 Toxics Release Inventory database released to the public in May 2000 by U.S. EPA, and were downloaded from the Right-to-Know Network (RTK-Net). Facilities designated as electric utilities reported SIC code 4911 as their primary SIC code. In most cases, no other SIC code was reported, although some facilities designated as electric utilities may have other subsidiary operations on site.

TRI Releases and Production-Related Waste

Facilities report their air emissions, surface water discharges, releases to land, and amounts of waste injected into on-site deep wells. These quantities were

develop emission factors that paint an accurate picture of the quantity of those impurities emitted to the air.

However, there is no requirement for facilities to develop and use such individualized emission factors, and they are just as likely to use national averages as emission factors for impurities in coal. Sixty-four percent of 1998 toxic chemical air emissions from power plants were estimated by emission factors, as compared to 33 percent for non-utility toxic air emissions.

Even if two plants have similar operations, they can report huge differences in releases depending on the emission factors they use. Although TRI requires plants to report that they used emission factors to estimate a given release quantity, they are not required to report which emission factors they used. And since such a large percentage of power plant releases are estimated by emission factors, it's difficult to compare any two power plants to one another. For this reason, this report does not rank emissions from individual plants, either nationally or within states.

Matching Electric Utility Data among Databases

Facilities reporting to TRI are assigned a unique TRI Facility Identification number. These facilities also report data to EPA's Acid Rain Program's

individual units, rather than on the whole plant. A power plant can have controls on none, one, some, or all of its boiler units. In trying to assess the impact of SO_2 controls, it was necessary first to find the universe of coal-fired power plants in the TRI database that also have data on SO_2

Power Generation and Emissions Data for Power Plants with and without SO_2 Controls

	Uncontrolled Power Plants	Controlled Power Plants
Number of Power Plants	39	4
Total Power Generation (MwH)	205,101,634	49,699,368
Total Heat Input (MBTU)		

Appendix 3: Potential Human Health Effects of Some Chemicals Released by Electric Power Plants

Chemical(s)	High Exposure Effects	Longer and Lower Exposure Effects
Hydrochloric Acid	Inhalation can irritate the lungs, as well as mouth, nose and throat; higher exposures can lead to fluid buildup (pulmonary edema), a medical emergency. Dermal contact can cause severe, permanent eye and skin damage. (NJDOH)	Repeated inhalation can lead to bronchitis. Exposure to vapor may cause erosion of teeth. Some evidence of increased lung cancer in exposed workers. (NJDOH)
Sulfuric Acid	Inhalation can irritate the lungs; higher exposures can lead to fluid buildup (pulmonary edema), a medical emergency. Contact with skin and eyes can cause third-degree burns and blindness. (NJDOH)	Repeated inhalation can lead to bronchitis, and may lead to emphysema. Exposure to vapor may cause chronic runny nose, tearing of the eyes, nosebleeds and stomach upset, as well as erosion and pitting of the teeth. Some evidence of increased lung cancer in exposed workers. (NJDOH)
Hydrofluoric Acid	Inhalation effects include damage to lungs and heart, death. Dermal contact will burn skin and eyes. (ATSDR)	Irritation of eyes, skin, and lungs. (ATSDR)
Manganese and Manganese Compounds	Exposure to heated fumes can cause "metal fume fever" with symptoms similar to flu, as well as congestion and coughing (manganese "pneumonia"). (NJDOH)	Repeated exposure may cause brain damage, with ultimate effects resembling Parkinson's disease. May damage liver, kidney, lungs. (NJDOH) Too much manganese can cause serious effects on the central nervous system. Workers in certain industries who have been exposed to airborne dust containing manganese for many months or years may have mental or emotional disturbances and their body movements may become slow and clumsy. Some of these symptoms may be treated, but some may be caused by permanent brain injury. (EPA1)

Nickel and Nickel Compounds	Inhalation effects include bronchitis and reduced lung function. (ATSDR)	Allergic skin rashes. Cancer of lung and nasal sinus seen in nickel workers, inhalation of certain nickel compounds caused cancer in laboratory studies. (ATSDR)
Chromium and Chromium Compounds	Some forms are more toxic than others. Inhalation effects include irritation/damage to nose, lungs, stomach, and intestines. Some persons are allergic, and high exposure may trigger asthma. (ATSDR)	Some chromium compounds are known human carcinogens, based both on exposed workers and also on laboratory studies. Animal studies indicate reproductive effects and fetal toxicity. (ATSDR)
Toluene	Dizziness, fatigue, unconsciousness, and death. Permanent brain and nervous system damage from repeated high-level exposure, including speech damage, vision and hearing problems, loss of muscle control, and poor balance. Also affects kidneys and leads to fetal toxicity. (ATSDR)	Fatigue, confusion, weakness, appearance of intoxication, memory loss, nausea, loss of appetite, hearing loss. (ATSDR) Also considered a developmental toxicant under California's Proposition 65.
n-Hexane	Alterations in the respiratory tract of laboratory animals, also observed limb paralysis, liver damage, testicular damage. (EPA2)	Decrease in motor nerve conduction and other effects on the nervous system of exposed workers. (EPA2)
Selenium and Selenium Compounds	No data on inhalation available. For ingestion, walking becomes unsteady, labored breathing, possible death. Congestion of the liver, inflammation of the heart, degeneration of the lining of the digestive tract, and bone erosion. (EPA2)	No data on inhalation available. For ingestion, skin lesions, fatigue, anorexia, gastroenteritis, liver degeneration, enlarged spleen. (EPA2)

Main reference: *Taking Stock 1997: North American Pollutant Releases and Transfers.* Montreal: Commission for Environmental Cooperation (CEC), March 2000, Appendix C-1. CEC compiled from the New Jersey Department of Health and Senior Services (NJDOH) and the Agency Toxic Substance Disease Registry (ATSDR).

Additional data from EPA sources: *1997 Toxics Release Inventory*. EPA 745-R-99-003, April 1999 (EPA1); and Integrated Risk Information System (EPA2), available online at http://www.epa.gov/iris.