Table 11.1 – Emissions from Electricity Generators

(Thousand short tons of gas)

	1990	2000	2001	2002	2003	2004	2010	2015	2020	2025	2030
Coal Fired											
Carbon Dioxide	1,674,521	2,090,644	2,034,867	2,043,795	2,086,014	2,087,667	2,367,580	2,412,270	2,583,310	2,843,355	3,170,875
Sulfur Dioxide	15,220	10,623	10,004	9,732	NA	NA	NA	NA	NA	NA	NA
Nitrogen Oxide	5,642	4,563	4,208	4,094	NA	NA	NA	NA	NA	NA	NA
Methane	11	13	13	13	13	13	NA	NA	NA	NA	NA
Nitrous Oxide	25	31	31	31	31	32	NA	NA	NA	NA	NA
Petroleum Fired											
Carbon Dioxide	111,223	100,200	111,885	85,870	107,034	107,365	82,091	81,142	82,153	84,251	90,185
Sulfur Dioxide	639	482	529	343	NA	NA	NA	NA	NA	NA	NA
Nitrogen Oxide	221	166	170	130	NA	NA	NA	NA	NA	NA	NA
Methane	1	1	1	1	1	1	NA	NA	NA	NA	NA
Nitrous Oxide	1	1	1	1	1	1	NA	NA	NA	NA	NA
Gas Fired											
Carbon Dioxide	194,999	310,190	319,119	336,866	306,002	326,174	327,857	425,185	444,001	419,658	379,553
Sulfur Dioxide	1	232	262	8	NA	NA	NA	NA	NA	NA	NA
Nitrogen Oxide	565	422	359	270	NA	NA	NA	NA	NA	NA	NA
Methane	0	1	1	1	1	1	NA	NA	NA	NA	NA
Nitrous Oxide	0	1	1	1	1	1	NA	NA	NA	NA	NA
Other [1]											
Carbon Dioxide	NA	NA	NA	NA	NA		14,290	15,024	15,806	16,535	16,834
Sulfur Dioxide 2	49	59	55	210	NA	NA	NA	NA	NA	NA	NA
Nitrogen Oxide 2	235	180	180	206	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrous Oxide 3	1	1	0	1	1	1	NA	NA	NA	NA	NA
Total											
Carbon Dioxide	1,987,578	2,512,498	2,478,216	2,480,862	2,511,947	2,533,773	2,791,819	2,933,621	3,125,269	3,363,800	3,657,447
Sulfur Dioxide	15,909	11,396	10,850	10,293	10,596	10,888	6,515	5,101	4,453	4,189	4,103

Nitrogen Oxide	6,663	5,330	4,917	4,699	4,119	3,742	2,585	2,312	2,345	2,379	2,390
Mercury	NA	NA	NA	50,081	50,695	53,306	41,595	26,503	20,653	18,283	16,872
Methane	12	14	14	14	14	14	NA	NA	NA	NA	NA
Nitrous Oxide	26	33	33	33	33	33	NA	NA	NA	NA	NA
Sulfur Hexafluoride [4]	2	1	1	1	1	1	NA	NA	NA	NA	NA

Sources: EIA, *Annual Energy Outlook 2006*, DOE/EIA-0383 (2005) (Washington, D.C., February 2006), Tables A8 and A18; EIA, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2003) (Washington, D.C., November 2005) Tables 10, 17, 25, 29; and EPA, *National Emission Inventory - Air Pollutant Emission Trends*, "Average Annual Emissions, All Criteria Pollutants," August 2004, http://www.epa.gov/ttn/chief/trends/index.html.

Notes:

Emissions from electric-power sector only.

[1] Emissions total less than 500 tons.

[2] Emissions from plants fired by other fuels; includes internal-combustion generators.

[3] Emissions from wood-burning plants.

[4] Sulfur hexafluoride (SF6) is a colorless, odorless, nontoxic, and nonflammable gas used as an insulator in electric T&D equipment. SF6 has a 100-year global warming potential that is 22,200 times that of carbon dioxide and has an atmospheric lifetime of 3,200 years.

NA = not available

Table 11.2 – Installed Nameplate Capacity of Utility Steam-Electric Generators With Environmental Equipment

(Megawatts)

	1990	2000	2001	2002	2003	2004
Coal Fired						
Particulate Collectors	315,681	321,636	329,187	329,459	328,587	NA
Cooling Towers	134,199	146,093	154,747	154,750	155,158	NA
Scrubbers	69,057	89,675	97,804	98,363	99,257	NA
Total[1]	317,522	328,741	329,187	329,459	328,587	NA
Petroleum and Gas Fired						
Particulate Collectors	33,639	31,090	31,575	29,879	29,422	NA
Cooling Towers	28,359	29,427	34,649	45,747	55,770	NA
Scrubbers	65	0	184	310	310	NA
Total[1]	59,372	57,697	61,634	71,709	81,493	NA
Total						
Particulate Collectors	349,319	352,727	360,762	359,338	358,009	355,782
Cooling Towers	162,557	175,520	189,396	200,497	210,928	214,989
Scrubbers	69,122	89,675	97,988	98,673	99,567	101,492
Total[1]	376,894	386,438	390,821	401,168	409,954	409,769

Source: EIA, *Annual Energy Review 2004*, DOE/EIA-0384(2004) (Washington, D.C., September 2005), Table 12.8. 2004 Total Data: *EIA Electric Power Annual.* DOE/EIA-0348(2004), http://www.eia.doe.gov/cneaf/electricity/epa/epat5p2.html, Table 5.2.

Notes:

[1]Components are not additive, because some generators are included in more than one category.
Through 2000, data are for electric utilities with fossil-fueled, steam-electric capacity of 100 megawatts or greater. Beginning in 2001, data are for electric utilities and unregulated generating plants (independent power producers, commercial plants, and industrial plants) with fossil-fueled or combustible renewable steam-electric capacity of 100 megawatts or greater.
NA = not available

Table 11.3 – EPA-Forecasted Nitrogen Oxide, Sulfur Dioxide, and Mercury Emissions from Electric Generators

	EPA Base Case 2004				EPA CAIR Case 2004			
	2007	2010	2015	2020	2007	2010	2015	2020
SO_2 (Thousand Tons)	10,374	9,908	9,084	8,876	7,733	6,351	5,227	4,480
NOx (Thousand Tons)	3,665	3,679	3,721	3,758	3,600	2,453	2,212	2,231
CO_2 (Thousand Tons)	2,391	2,470	2,599	2,796	2,365	2,452	2,571	2,776

Source: Environmental Protection Agency (EPA), Runs Table for EPA Modeling Applications 2004, using IPM http://www.epa.gov/airmarkets/epa-ipm/iaqr.html, EPA Base Case for 2004 Analyses http://www.epa.gov/airmarkets/epa-ipm/iaqr/basecase2004.zip, and 2004 CAIR Case Final 2004 http://www.epa.gov/airmarkets/epa-ipm/iaqr/cair2004_final.zip

Notes:

Analytical Framework of IPM • EPA uses the Integrated Planning Model (IPM) to analyze the projected impact of environmental policies on the electric-power sector in the 48 contiguous states and the District of Columbia. Developed by ICF Resources Incorporated, and used to support public and private-sector clients, IPM is a multiregional, dynamic, deterministic linear programming model of the U.S. electric-power sector.
• The model provides forecasts of least-cost capacity expansion, electricity dispatch, and emission-control strategies for meeting energy demand and environmental, transmission, dispatch, and reliability constraints. IPM can be used to evaluate the cost and emissions impacts of proposed policies to limit emissions of sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon dioxide (CO_2), and mercury (Hg) from the electric-power sector

Table 11.4 – Origin of 2004 Allowable SO_2 Emissions Levels

Type of Allowance Allocation	Number of SO_2 Allowances	Explanation of Allowance Allocation Type
Initial Allocation	9,191,897	Initial allocation is the number of allowances granted to units, based on the product of their historic utilization and emissions rates specified in the Clean Air Act.
Allowance Auctions	250,000	The allowance auction provides allowances to the market that were set aside in a Special Allowance Reserve when the initial allowance allocation was made.
Opt-in Allowances	99,188	Opt-in Allowances are provided to units entering the program voluntarily. There were 11 opt-in units in 2004.
TOTAL 2004 ALLOCATION	**9,541,085**	
Banked Allowances	8,646,818	Banked Allowances are those allowances accrued in a unit's account from previous years, which can be used for compliance in 2004 or any future year.
TOTAL 2004 ALLOWABLE	**18,187,903**	

Source: EPA, *Acid Rain Program 2004 Progress Report*, Document EPA-430-R-05-011, November 2005, Figure 4. http://www.epa.gov/airmarkets/cmprpt/arp04/2004report.pdf