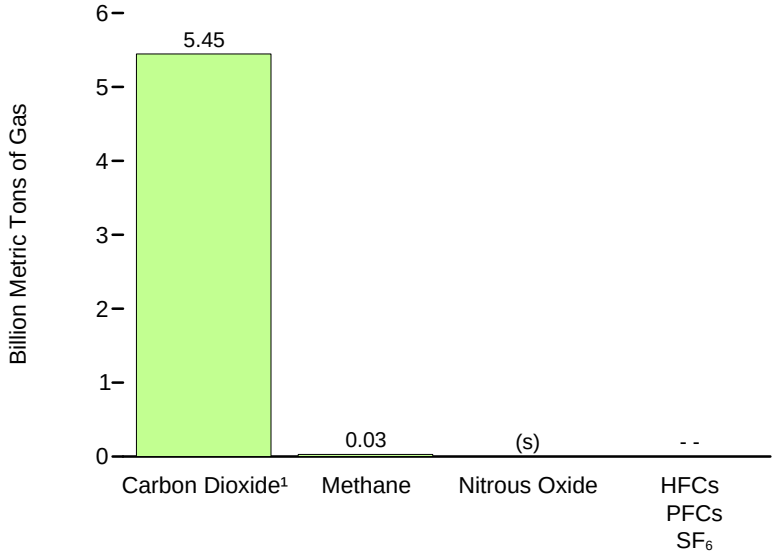
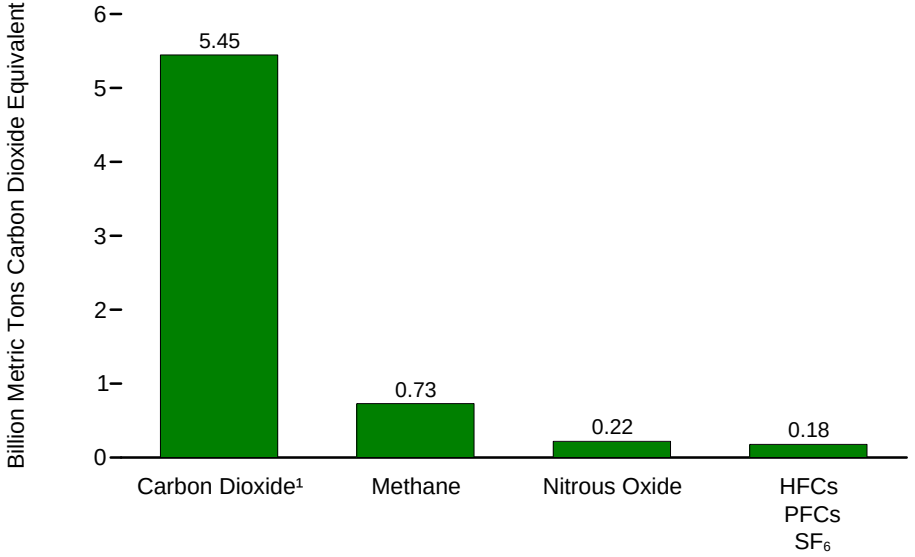
11. Environment

Figure 11.1 Emissions of Greenhouse Gases

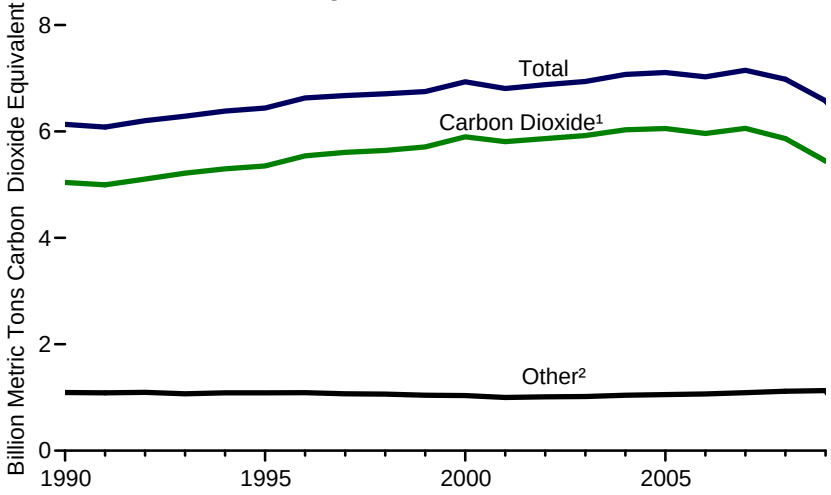
By Type of Gas, 2009



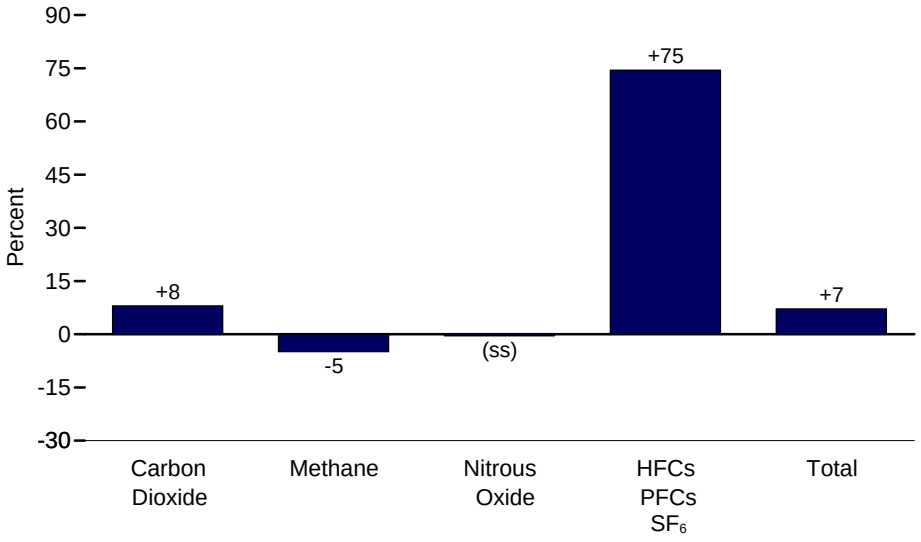
Based on Global Warming Potential, by Type of Gas, 2009



Based on Global Warming Potential, 1990-2009



Change 1990-2009, Based on Global Warming Potential



[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.
[2] Methane, nitrous oxide, HFCs, PFCs, and SF_6.
(s)=Less than 0.005 billion metric tons of gas.
(ss)= Less than 0.5 percent.
- - = Not applicable because these gases cannot be summed in native units.
Notes: • HFCs=hydrofluorocarbons; PFCs=perfluorocarbons; and SF_6=sulfur hexafluoride.
• Emissions by type of gas should not be compared; for comparison, see emissions based on global warming potential by type of gas.
Source: Table 11.1.

Table 11.1 Emissions of Greenhouse Gases, 1990-2009

	Greenhouse Gases								Greenhouse Gases, Based on Global Warming Potential [1]				
	Carbon Dioxide [2,3]												
Year	Energy Related [4]	U.S. Territories [5]	Bunker Fuels [6]	Other Sources [7]	Total	Methane	Nitrous Oxide	HFCs PFCs SF_6	Carbon Dioxide [2,3]	Methane	Nitrous Oxide	HFCs PFCs SF_6	Total
	Million Metric Tons of Gas								Million Metric Tons Carbon Dioxide Equivalent [2]				
1990	R5,039	32	-114	85	R5,041	R30.8	R0.7	– –	R5,041	R769	R221	102	R6,133
1991	R4,996	36	-121	86	R4,997	R30.8	R.7	– –	R4,997	R770	R223	93	R6,083
1992	R5,093	36	-111	88	R5,106	R30.9	R.8	– –	R5,106	R772	R228	R97	R6,204
1993	R5,185	38	R-101	94	R5,217	R29.8	R.8	– –	R5,217	R744	R229	97	R6,287
1994	R5,258	41	-99	97	R5,297	R29.8	R.8	– –	R5,297	R745	R241	100	R6,384
1995	R5,314	39	-102	102	R5,353	R29.3	R.8	– –	R5,353	R733	R236	119	R6,442
1996	R5,501	38	-103	104	R5,540	R28.9	R.8	– –	R5,540	R722	R238	130	R6,630
1997	R5,575	39	-111	104	R5,608	R28.3	R.8	– –	R5,608	R706	R224	R138	R6,676
1998	R5,622	41	-116	96	R5,644	R27.5	R.7	– –	R5,644	R688	R222	R154	R6,708
1999	R5,682	41	R-111	97	R5,709	R26.8	R.7	– –	R5,709	R669	R220	R152	R6,750
2000	R5,867	43	R-107	98	R5,900	R26.5	R.7	– –	R5,900	R663	R218	R154	R6,935
2001	R5,759	54	R-103	97	R5,808	R26.0	R.7	– –	R5,808	R649	R211	R141	R6,809
2002	R5,809	53	R-93	98	R5,867	R26.0	R.7	– –	R5,867	R651	R210	R152	R6,880
2003	R5,857	57	R-90	99	R5,923	R26.4	R.7	– –	R5,923	R661	R212	R145	R6,941
2004	R5,975	61	R-106	102	R6,031	R26.5	R.7	– –	R6,031	R662	R222	R157	R7,072
2005	R5,996	58	R-103	103	R6,055	R26.8	R.8	– –	R6,055	R669	R224	R161	R7,109
2006	R5,918	R60	R-122	106	R5,962	R27.1	R.8	– –	R5,962	R679	R224	R164	R7,027
2007	R6,022	R57	R-125	R105	R6,060	R27.6	R.8	– –	R6,060	R691	R229	R171	R7,150
2008	R5,838	R50	R-126	104	R5,866	R29.0	R.7	– –	R5,866	R724	R223	R170	R6,983
2009	5,425	47	-113	87	5,446	29.2	.7	– –	5,446	731	220	178	6,575

[1] Emissions of greenhouse gases are weighted based upon their relative global warming potential (GWP), with carbon dioxide equal to a weight of one (see 100-year net global warming potentials at http://www.eia.gov/environment/emissions/ghg_report/pdf/tbl5.pdf). See "Global Warming Potential" in Glossary.

[2] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[3] Excludes carbon dioxide emissions from biomass energy consumption. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[4] U.S. carbon dioxide emissions from: fossil fuel combustion; the nonfuel use of fossil fuels; and electric power sector use of geothermal energy and non-biomass waste. Geographic coverage is the 50 States and the District of Columbia.

[5] U.S. Territories' energy-related carbon dioxide emissions. Geographic coverage is American Samoa, Guam, Puerto Rico, U.S. Pacific Islands, U.S. Virgin Islands, and Wake Island. According to the "United Nations Framework on Climate Change" (UNFCC), emissions from the U.S. Territories are included in the U.S. inventory.

[6] U.S. carbon dioxide emissions from bunker fuels (marine, aviation, and military). According to the UNFCC, emissions from bunker fuels are excluded from the U.S. inventory.

[7] U.S. carbon dioxide emissions from: cement manufacture; limestone consumption; flaring of natural gas at the wellhead, and carbon dioxide scrubbed from natural gas; soda ash manufacture and consumption; carbon dioxide manufacture; aluminum manufacture; shale oil production; and waste combustion in the commercial and industrial sectors.

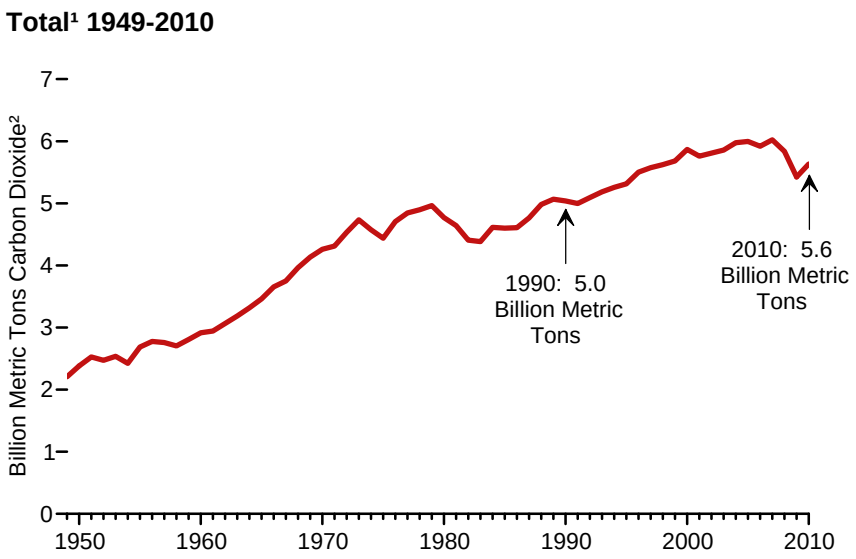
R=Revised. – – =Not applicable because these gases cannot be summed in native units.

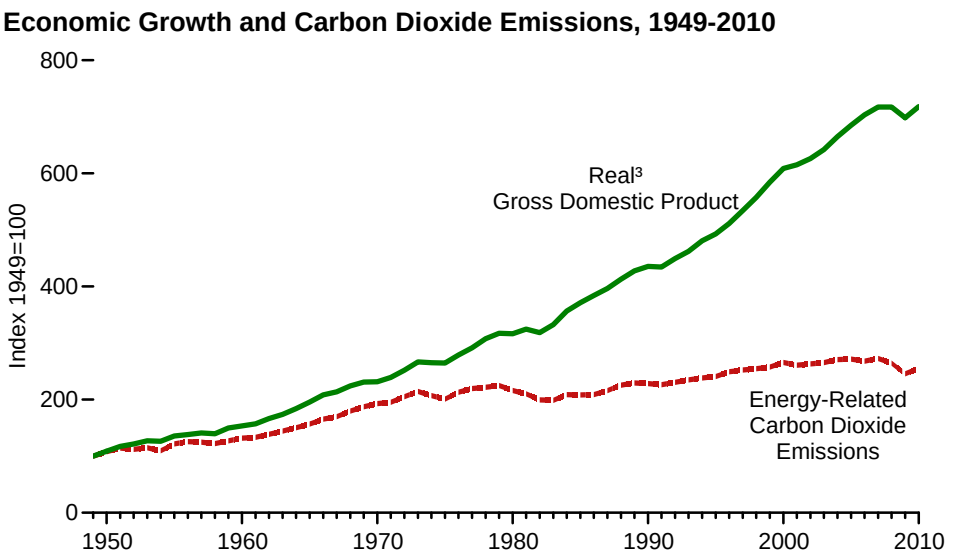
Notes: • HFCs = hydrofluorocarbons; PFCs = perfluorocarbons; and SF_6 = sulfur hexafluoride. • Emissions are from anthropogenic sources. "Anthropogenic" means produced as the result of human activities, including emissions from agricultural activity and domestic livestock. Emissions from natural sources, such as wetlands and wild animals, are not included. • Because of the continuing goal to improve estimation methods for greenhouse gases, data are frequently revised on an annual basis in keeping with the latest findings of the international scientific community. Revisions reflect updates to GWP estimates, as well as to energy consumption data and updated emission factors, where applicable. • Totals may not equal sum of components due to independent rounding.

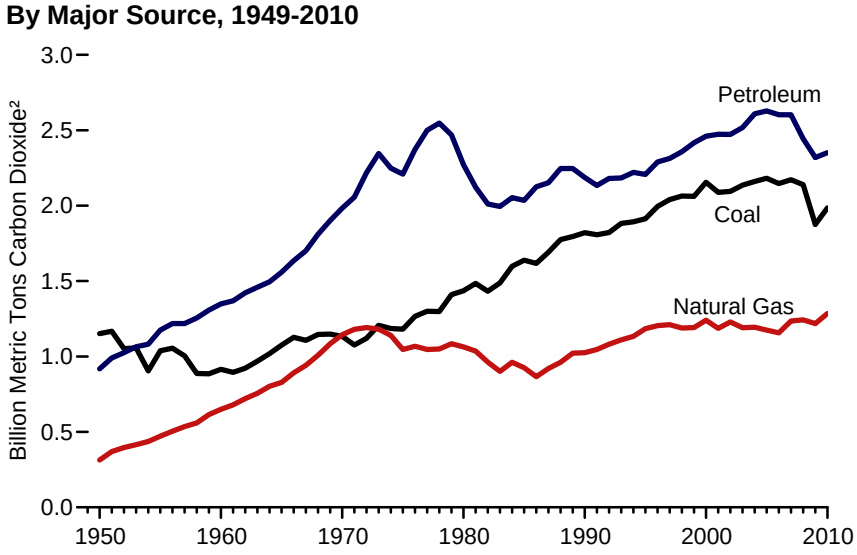
Web Page: For related information, see http://www.eia.gov/environment/.

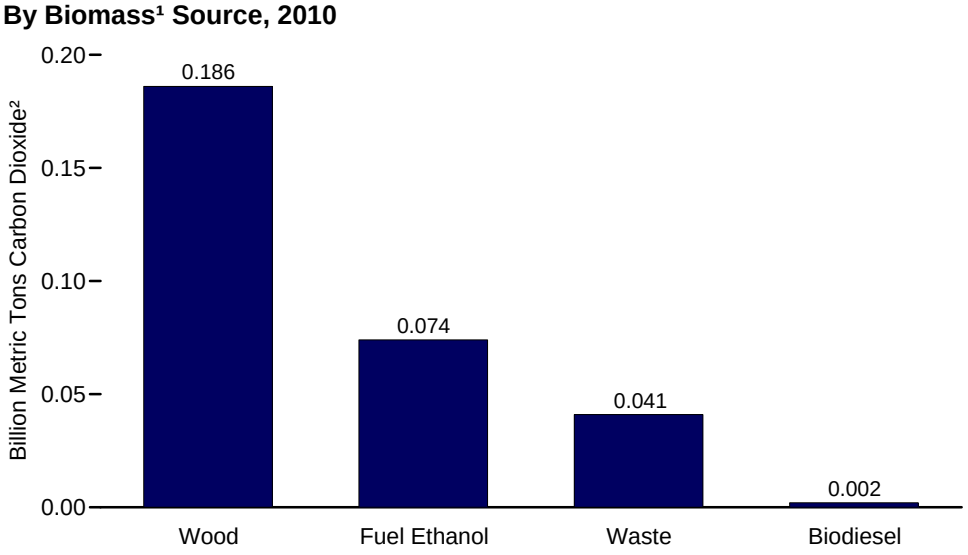
Sources: **Energy-Related Carbon Dioxide:** Table 11.2. **Total Carbon Dioxide (columns 5 and 9):** Calculated as the sum of columns 1-4. **Methane (column 6):** Table 11.4. **Nitrous Oxide (column 7):** Table 11.5. **Total Greenhouse Gases:** Calculated as the sum of columns 9-12. **All Other Data:** U.S. Energy Information Administration (EIA), *Emissions of Greenhouse Gases in the United States 2009* (March 2011), Tables 1, 15, and 16.

Figure 11.2 Carbon Dioxide Emissions From Energy Consumption









[1] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[2] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[3] Based on chained (2005) dollars.

Sources: Tables 1.5, 11.2, and 11.3a-11.3e.

Table 11.2 Carbon Dioxide Emissions From Energy Consumption by Source, Selected Years, 1949-2010

(Million Metric Tons of Carbon Dioxide [1])

Year	Coal [3]	Natural Gas [4]	Petroleum											Total [2,9]	*Biomass* [2]				
			Aviation Gasoline	Distillate Fuel Oil [5]	Jet Fuel	Kero-sene	LPG [6]	Lubri-cants	Motor Gasoline [7]	Petroleum Coke	Residual Fuel Oil	Other [8]	Total		*Wood* [10]	*Waste* [11]	*Fuel Ethanol* [12]	*Bio-diesel*	*Total*
1949	1,118	270	12	140	NA	42	13	7	329	8	244	25	820	2,207	*145*	*NA*	*NA*	*NA*	*145*
1950	1,152	313	14	168	NA	48	16	9	357	8	273	26	918	2,382	*147*	*NA*	*NA*	*NA*	*147*
1955	1,038	472	24	247	21	48	27	10	473	13	274	38	1,175	2,685	*134*	*NA*	*NA*	*NA*	*134*
1960	915	650	21	291	53	41	42	10	543	29	275	45	1,349	2,914	*124*	*NA*	*NA*	*NA*	*124*
1965	1,075	828	15	330	87	40	57	11	627	39	289	65	1,559	3,462	*125*	*NA*	*NA*	*NA*	*125*
1970	1,134	1,144	7	394	141	39	78	11	789	41	396	85	1,983	4,261	*134*	*(s)*	*NA*	*NA*	*134*
1975	1,181	1,047	5	443	146	24	82	11	911	48	443	97	2,209	4,437	*140*	*(s)*	*NA*	*NA*	*141*
1976	1,266	1,068	5	488	144	25	86	13	955	47	506	103	2,372	4,705	*161*	*(s)*	*NA*	*NA*	*161*
1977	1,300	1,046	5	520	152	26	85	13	979	52	553	115	2,500	4,846	*172*	*(s)*	*NA*	*NA*	*172*
1978	1,298	1,050	5	533	154	26	83	14	1,011	50	544	127	2,548	4,896	*191*	*(s)*	*NA*	*NA*	*191*
1979	1,410	1,085	5	514	157	28	95	15	960	48	509	139	2,469	4,964	*202*	*(s)*	*NA*	*NA*	*202*
1980	1,436	1,063	4	446	156	24	87	13	900	46	453	142	2,272	4,770	*232*	*(s)*	*NA*	*NA*	*232*
1981	1,485	1,036	4	439	147	19	85	13	899	48	376	93	2,122	4,642	*234*	*5*	*(s)*	*NA*	*240*
1982	1,433	963	3	415	148	19	85	11	892	49	309	80	2,011	4,406	*235*	*7*	*1*	*NA*	*244*
1983	1,488	901	3	418	153	19	85	12	904	48	255	98	1,995	4,383	*252*	*10*	*2*	*NA*	*264*
1984	1,598	962	3	443	172	17	88	13	914	51	247	106	2,053	4,613	*252*	*13*	*3*	*NA*	*267*
1985	1,638	926	3	445	178	17	86	12	930	55	216	93	2,035	4,600	*252*	*14*	*3*	*NA*	*270*
1986	1,617	866	4	453	191	15	83	12	958	56	255	98	2,125	4,608	*240*	*16*	*4*	*NA*	*260*
1987	1,691	920	3	463	202	14	82	13	982	60	227	106	2,152	4,764	*231*	*18*	*5*	*NA*	*253*
1988	1,775	962	3	487	212	14	83	13	1,003	63	249	119	2,246	4,982	*242*	*19*	*5*	*NA*	*266*
1989	1,795	1,022	3	491	218	13	82	13	1,000	62	246	118	2,246	5,067	*251*	*22*	*5*	*NA*	*278*
1990	R1,821	1,025	3	470	223	6	69	13	988	67	220	127	R2,187	R5,039	*208*	*24*	*4*	*NA*	*237*
1991	R1,807	1,047	3	454	215	7	71	12	982	66	207	117	R2,134	R4,996	*208*	*26*	*5*	*NA*	*239*
1992	R1,822	1,082	3	464	213	6	77	12	999	74	196	135	R2,180	R5,093	*217*	*27*	*6*	*NA*	*250*
1993	R1,882	1,110	3	473	215	7	76	12	1,015	76	193	114	2,184	R5,185	*212*	*28*	*7*	*NA*	*246*
1994	R1,893	1,134	3	492	224	7	79	13	1,022	74	183	124	R2,221	R5,258	*218*	*29*	*7*	*NA*	*255*
1995	R1,913	1,184	3	498	222	8	78	13	1,044	75	152	114	R2,207	R5,314	*222*	*30*	*8*	*NA*	*260*
1996	R1,995	1,205	3	524	232	9	84	12	1,063	78	152	132	2,290	R5,501	*229*	*32*	*6*	*NA*	*266*
1997	R2,040	1,211	3	534	234	10	85	13	1,075	79	142	138	2,313	R5,575	*222*	*30*	*7*	*NA*	*259*
1998	R2,064	1,189	2	538	238	12	75	14	1,107	89	158	125	R2,358	R5,622	*205*	*30*	*8*	*NA*	*242*
1999	R2,062	1,192	3	555	245	11	91	14	1,127	93	148	130	2,417	R5,682	*208*	*29*	*8*	*NA*	*245*
2000	R2,155	1,241	3	580	254	10	102	14	1,135	84	163	117	2,461	R5,867	*212*	*27*	*9*	*NA*	*248*
2001	R2,088	1,187	2	598	243	11	92	13	1,151	88	145	132	2,473	R5,759	*188*	*33*	*10*	*(s)*	*231*
2002	R2,095	1,229	2	587	237	6	98	12	1,183	94	125	127	R2,472	R5,809	*187*	*36*	*12*	*(s)*	*235*
2003	R2,136	1,191	2	610	231	8	95	11	1,188	94	138	140	R2,518	R5,857	*188*	*36*	*16*	*(s)*	*240*
2004	R2,160	1,194	2	632	240	10	98	12	1,214	105	155	142	R2,609	R5,975	*199*	*35*	*20*	*(s)*	*255*
2005	R2,182	1,175	2	640	246	10	94	12	1,214	105	164	141	R2,628	R5,996	*200*	*37*	*23*	*1*	*261*
2006	R2,147	1,157	2	648	240	8	93	11	1,224	104	122	150	R2,603	R5,918	*198*	*36*	*31*	*2*	*267*
2007	R2,172	1,235	2	652	238	5	94	12	1,227	98	129	148	R2,603	R6,022	*197*	*37*	*39*	*3*	*277*
2008	R2,139	R1,243	2	615	226	2	89	11	1,166	92	111	130	R2,444	R5,838	*192*	*40*	*55*	*3*	*289*
2009	R1,876	R1,218	2	564	204	3	91	10	1,157	87	91	111	R2,320	R5,425	*176*	*41*	*62*	*3*	*283*
2010P	1,985	1,285	2	589	209	3	92	11	1,150	77	98	121	2,351	5,633	*186*	*41*	*74*	*2*	*304*

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions in this table. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[3] Includes coal coke net imports.

[4] Natural gas, excluding supplemental gaseous fuels.

[5] Distillate fuel oil, excluding biodiesel.

[6] Liquefied petroleum gases.

[7] Finished motor gasoline, excluding fuel ethanol.

[8] Aviation gasoline blending components, crude oil, motor gasoline blending components, pentanes plus, petrochemical feedstocks, special naphthas, still gas, unfinished oils, waxes, and miscellaneous petroleum products.

[9] Includes electric power sector use of geothermal energy and non-biomass waste. See Table 11.3e.

[10] Wood and wood-derived fuels.

[11] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

[12] Fuel ethanol minus denaturant.

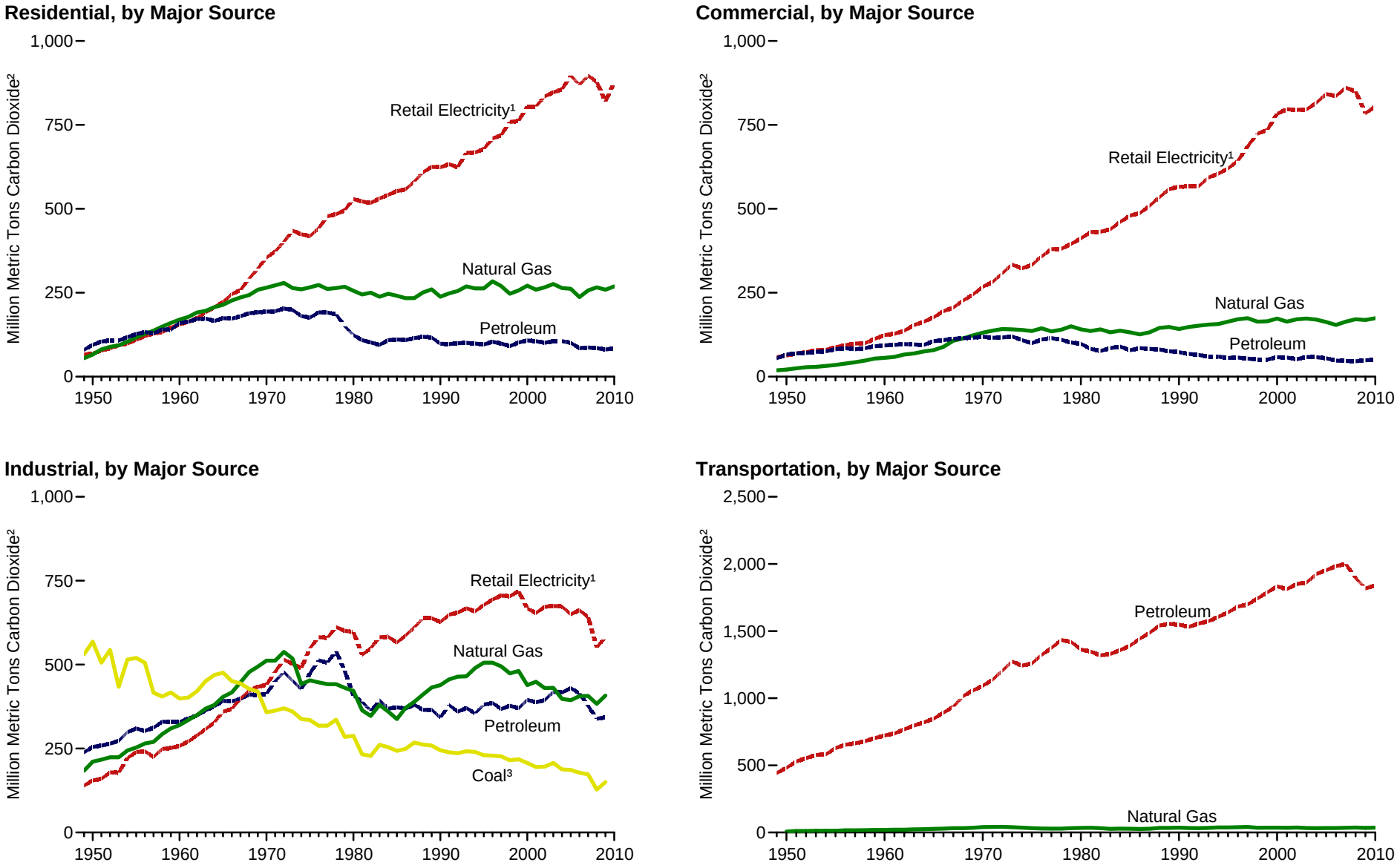
R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 million metric tons of carbon dioxide.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption, including the nonfuel use of fossil fuels. • See "Carbon Dioxide" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Pages: • See http://www.eia.gov/totalenergy/data/annual/#environment for all data beginning in 1949. • For current data, see http://www.eia.gov/totalenergy/data/monthly/#environment. • For related information, see http://www.eia.gov/environment/.

Sources: • 1949-1972—U.S. Energy Information Administration (EIA) estimates based on data in *Annual Energy Review* Tables 2.1b-2.1f, 5.12, 7.3, 7.8, 10.2a-10.2c, and A5. • 1973 forward—EIA, *Monthly Energy Review* (April 2011), Tables 12.1 and 12.7.

Figure 11.3 Carbon Dioxide Emissions From Energy Consumption by End-Use Sector, 1949-2010



[1] Emissions from energy consumption in the electric power sector are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales (see Tables 8.9 and 11.3e).

[2] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[3] Includes coal coke net imports.

Source: Tables 11.3a-11.3e.

Table 11.3a Carbon Dioxide Emissions From Energy Consumption: Residential Sector, Selected Years, 1949-2010

(Million Metric Tons of Carbon Dioxide [1])

Year	Coal	Natural Gas [3]	Petroleum				Retail Electricity [5]	Total [2]	*Biomass* [2]	
			Distillate Fuel Oil [4]	Kerosene	Liquefied Petroleum Gases	Total			*Wood* [6]	*Total* [6]
1949	121	55	51	21	7	80	66	R321	*99*	*99*
1950	120	66	61	25	9	R95	69	R350	*94*	*94*
1955	83	117	87	27	13	R127	110	R436	*73*	*73*
1960	56	170	115	26	19	R160	156	R542	*59*	*59*
1965	34	214	125	24	24	R174	223	R644	*44*	*44*
1970	20	265	137	22	35	R194	355	R833	*38*	*38*
1975	6	266	132	12	32	R176	419	R867	*40*	*40*
1976	6	273	145	13	34	R192	442	R913	*45*	*45*
1977	5	261	146	12	33	R191	478	R935	*51*	*51*
1978	5	264	143	11	32	R186	484	R938	*58*	*58*
1979	4	268	119	10	21	R150	496	R918	*68*	*68*
1980	3	256	96	8	20	R124	529	911	*80*	*80*
1981	3	245	84	6	19	R109	522	R878	*82*	*82*
1982	3	250	77	7	18	R102	518	R873	*91*	*91*
1983	3	238	68	6	22	R95	531	R867	*91*	*91*
1984	4	247	80	12	18	R109	542	R902	*92*	*92*
1985	4	241	80	11	20	R111	553	R909	*95*	*95*
1986	4	234	81	9	19	R109	558	R905	*86*	*86*
1987	4	234	85	9	22	R115	581	R934	*80*	*80*
1988	4	251	87	10	22	R119	609	R982	*85*	*85*
1989	3	260	85	8	24	117	625	R1,005	*86*	*86*
1990	3	238	72	5	22	R98	R624	R963	*54*	*54*
1991	2	248	68	5	24	R97	R633	R980	*57*	*57*
1992	2	255	72	5	23	R100	R624	R981	*60*	*60*
1993	2	269	71	5	25	R101	R667	R1,040	*52*	*52*
1994	2	263	70	5	24	R99	R668	R1,032	*49*	*49*
1995	2	263	66	5	25	R96	R678	R1,039	*49*	*49*
1996	2	284	68	6	30	R104	R710	R1,099	*51*	*51*
1997	2	270	64	7	29	R99	R719	R1,090	*40*	*40*
1998	1	247	56	8	27	R91	R759	R1,097	*36*	*36*
1999	1	257	61	8	33	R102	R762	R1,122	*37*	*37*
2000	1	271	66	7	35	R108	R805	R1,185	*39*	*39*
2001	1	259	66	7	33	R106	R805	R1,172	*35*	*35*
2002	1	266	63	4	34	R101	R835	R1,204	*36*	*36*
2003	1	276	66	5	34	R106	R847	R1,230	*38*	*38*
2004	1	264	68	6	32	R106	R856	R1,228	*38*	*38*
2005	1	262	62	6	32	R101	R897	R1,261	*40*	*40*
2006	1	237	52	5	28	R85	R869	R1,192	*37*	*37*
2007	1	257	53	3	31	R87	R897	R1,242	*40*	*40*
2008	1	R266	49	2	35	R85	R878	R1,229	*42*	*42*
2009	1	259	44	2	35	R81	819	1,159	*40*	*40*
2010P	1	269	46	2	35	84	878	1,231	*39*	*39*

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions in this table. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[3] Natural gas, excluding supplemental gaseous fuels.

[4] Distillate fuel oil, excluding biodiesel.

[5] Emissions from energy consumption (for electricity and a small amount of useful thermal output) in the electric power sector are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Tables 8.9 and 11.3e.

[6] Wood and wood-derived fuels.

R=Revised. P=Preliminary.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption. • See "Carbon Dioxide" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Pages: • See http://www.eia.gov/totalenergy/data/annual/#environment for all data beginning in 1949. • For current data, see http://www.eia.gov/totalenergy/data/monthly/#environment. • For related information, see http://www.eia.gov/environment/.

Sources: • 1949-1972—U.S. Energy Information Administration (EIA) estimates based on data in *Annual Energy Review* Tables 2.1b, 5.14a, 8.9, 10.2a, and 11.3e. • 1973 forward—EIA, *Monthly Energy Review* (April 2011), Tables 12.2 and 12.7.

Table 11.3b Carbon Dioxide Emissions From Energy Consumption: Commercial Sector, Selected Years, 1949-2010

(Million Metric Tons of Carbon Dioxide [1])

Year	Coal	Natural Gas [3]	Petroleum							Retail Electricity [7]	Total [2]	*Biomass* [2]			
			Distillate Fuel Oil [4]	Kerosene	LPG [5]	Motor Gasoline [6]	Petroleum Coke	Residual Fuel Oil	Total			*Wood* [8]	*Waste* [9]	*Fuel Ethanol* [10]	*Total*
1949	148	19	16	3	2	7	NA	28	55	58	280	*2*	*NA*	*NA*	*2*
1950	147	21	19	3	2	7	NA	33	R66	63	R297	*2*	*NA*	*NA*	*2*
1955	76	35	28	4	3	9	NA	38	R82	88	R281	*1*	*NA*	*NA*	*1*
1960	39	56	36	3	5	5	NA	44	R93	124	R312	*1*	*NA*	*NA*	*1*
1965	25	79	39	4	6	5	NA	51	R106	177	R387	*1*	*NA*	*NA*	*1*
1970	16	131	43	4	9	6	NA	56	R119	268	R534	*1*	*NA*	*NA*	*1*
1975	14	136	43	4	8	6	NA	39	R100	333	583	*1*	*NA*	*NA*	*1*
1976	14	144	48	3	9	7	NA	45	111	358	627	*1*	*NA*	*NA*	*1*
1977	14	135	49	4	9	7	NA	46	115	380	645	*1*	*NA*	*NA*	*1*
1978	16	140	49	4	8	8	NA	42	110	381	R648	*1*	*NA*	*NA*	*1*
1979	14	150	43	6	6	7	NA	40	R102	395	661	*1*	*NA*	*NA*	*1*
1980	11	141	38	3	6	8	NA	44	98	412	662	*2*	*NA*	*NA*	*2*
1981	13	136	33	5	5	7	NA	33	83	431	R663	*2*	*NA*	*(s)*	*2*
1982	15	141	32	2	5	6	NA	31	77	432	R665	*2*	*NA*	*(s)*	*2*
1983	15	132	48	8	6	7	NA	16	85	439	671	*2*	*NA*	*(s)*	*2*
1984	16	137	54	3	5	8	NA	21	90	461	704	*2*	*NA*	*(s)*	*2*
1985	13	132	46	2	6	7	NA	18	79	480	704	*2*	*NA*	*(s)*	*2*
1986	13	126	46	4	6	8	NA	23	85	487	R711	*3*	*NA*	*(s)*	*3*
1987	12	132	44	4	6	8	NA	21	83	509	R736	*3*	*NA*	*(s)*	*3*
1988	12	145	44	2	6	8	NA	21	R81	534	772	*3*	*NA*	*(s)*	*3*
1989	11	148	42	2	7	7	0	18	76	559	794	*7*	*1*	*(s)*	*9*
1990	12	142	39	1	6	8	0	18	R73	R566	R793	*6*	*2*	*(s)*	*8*
1991	11	148	38	1	7	6	0	17	68	R567	R794	*6*	*2*	*(s)*	*8*
1992	11	152	37	1	7	6	(s)	15	65	R567	R796	*7*	*2*	*(s)*	*9*
1993	11	155	36	1	7	2	(s)	14	R60	R593	R819	*7*	*2*	*(s)*	*9*
1994	11	157	37	1	7	2	(s)	14	60	R605	R833	*7*	*2*	*(s)*	*9*
1995	11	164	35	2	7	1	(s)	11	56	R620	R851	*7*	*2*	*(s)*	*9*
1996	12	171	35	2	8	2	(s)	11	57	R643	R883	*7*	*3*	*(s)*	*10*
1997	12	174	32	2	8	3	(s)	9	R54	R686	R926	*7*	*3*	*(s)*	*10*
1998	9	164	31	2	7	3	(s)	7	R51	R724	R947	*6*	*3*	*(s)*	*9*
1999	10	165	32	2	9	2	(s)	6	R51	R735	R960	*6*	*3*	*(s)*	*9*
2000	9	173	36	2	9	3	(s)	7	R58	R783	R1,022	*7*	*2*	*(s)*	*9*
2001	9	164	37	2	9	3	(s)	6	R57	R797	R1,027	*6*	*2*	*(s)*	*9*
2002	9	171	32	1	9	3	(s)	6	R52	R795	R1,027	*6*	*2*	*(s)*	*9*
2003	8	173	35	1	10	4	(s)	9	59	R796	R1,036	*7*	*3*	*(s)*	*9*
2004	10	170	34	1	10	3	(s)	10	58	R816	R1,054	*7*	*3*	*(s)*	*10*
2005	9	163	33	2	8	3	(s)	9	R55	R842	R1,069	*7*	*3*	*(s)*	*10*
2006	6	154	29	1	8	3	(s)	6	R48	R836	R1,043	*6*	*3*	*(s)*	*9*
2007	7	164	28	1	8	4	(s)	6	R47	R861	R1,079	*7*	*3*	*(s)*	*9*
2008	7	R171	27	(s)	10	3	(s)	6	46	R850	R1,074	*7*	*3*	*(s)*	*10*
2009	6	169	30	(s)	9	4	(s)	6	R49	R785	R1,008	*7*	*3*	*(s)*	*10*
2010P	5	174	32	(s)	9	4	(s)	7	51	805	1,035	*7*	*3*	*(s)*	*10*

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions in this table. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[3] Natural gas, excluding supplemental gaseous fuels.

[4] Distillate fuel oil, excluding biodiesel.

[5] Liquefied petroleum gases.

[6] Finished motor gasoline, excluding fuel ethanol.

[7] Emissions from energy consumption (for electricity and a small amount of useful thermal output) in the electric power sector are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Tables 8.9 and 11.3e.

[8] Wood and wood-derived fuels.

[9] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

[10] Fuel ethanol minus denaturant.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 million metric tons of carbon dioxide.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption. • See "Carbon Dioxide" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Pages: • See http://www.eia.gov/totalenergy/data/annual/#environment for all data beginning in 1949. • For current data, see http://www.eia.gov/totalenergy/data/monthly/#environment. • For related information, see http://www.eia.gov/environment/.

Sources: • 1949-1972—U.S. Energy Information Administration (EIA) estimates based on data in *Annual Energy Review* Tables 2.1c, 5.14a, 8.9, 10.2a, and 11.3e. • 1973 forward—EIA, *Monthly Energy Review (MER)* (April 2011), Tables 12.3 and 12.7, and MER data system calculations.

Table 11.3c Carbon Dioxide Emissions From Energy Consumption: Industrial Sector, Selected Years, 1949-2010

(Million Metric Tons of Carbon Dioxide [1])

Year	Coal	Coal Coke Net Imports	Natural Gas [3]	Petroleum									Retail Electricity [8]	Total [2]	*Biomass* [2]			
				Distillate Fuel Oil [4]	Kerosene	LPG [5]	Lubricants	Motor Gasoline [6]	Petroleum Coke	Residual Fuel Oil	Other [7]	Total			*Wood* [9]	*Waste* [10]	*Fuel Ethanol* [11]	*Total*
1949	500	-1	166	41	18	3	3	16	8	95	25	209	120	R995	*44*	*NA*	*NA*	*44*
1950	531	(s)	184	51	20	4	3	18	8	110	26	239	140	R1,095	*50*	*NA*	*NA*	*50*
1955	516	-1	244	72	17	10	4	24	13	122	38	299	222	R1,281	*59*	*NA*	*NA*	*59*
1960	418	-1	310	74	12	17	4	27	29	123	45	R329	252	R1,308	*64*	*NA*	*NA*	*64*
1965	471	-2	380	83	12	24	5	24	39	123	65	R376	328	R1,553	*80*	*NA*	*NA*	*80*
1970	427	-7	494	89	13	31	6	21	39	126	85	R410	434	R1,759	*96*	*NA*	*NA*	*96*
1975	336	2	442	97	9	39	6	16	48	117	97	R427	490	R1,696	*100*	*NA*	*NA*	*100*
1976	335	(s)	453	111	9	41	6	15	47	141	103	R474	549	R1,811	*114*	*NA*	*NA*	*114*
1977	316	2	447	125	10	40	7	14	52	150	115	R513	582	R1,860	*120*	*NA*	*NA*	*120*
1978	304	14	442	127	11	40	7	13	48	133	127	R506	580	R1,846	*131*	*NA*	*NA*	*131*
1979	329	7	442	128	13	66	8	11	47	128	139	R540	612	R1,931	*132*	*NA*	*NA*	*132*
1980	289	-4	431	96	13	61	7	11	45	105	142	R480	601	R1,797	*150*	*NA*	*NA*	*150*
1981	290	-2	422	101	8	58	6	11	47	83	93	R408	597	R1,715	*150*	*5*	*(s)*	*156*
1982	235	-2	364	95	10	60	6	10	48	81	80	R390	529	R1,515	*142*	*7*	*(s)*	*149*
1983	230	-2	347	83	5	55	6	8	48	61	98	R362	549	R1,486	*159*	*9*	*(s)*	*168*
1984	262	-1	380	87	3	62	7	11	50	68	106	R394	582	R1,617	*157*	*12*	*(s)*	*170*
1985	256	-2	360	81	3	58	6	15	54	57	93	R369	583	R1,566	*154*	*14*	*(s)*	*168*
1986	245	-2	338	84	2	56	6	15	55	57	98	R373	566	R1,520	*151*	*16*	*(s)*	*167*
1987	248	1	371	83	2	53	7	15	59	45	106	R369	587	R1,575	*148*	*17*	*(s)*	*165*
1988	263	5	389	82	2	54	7	14	61	42	119	R381	611	R1,648	*152*	*19*	*(s)*	*171*
1989	259	3	411	83	2	49	7	14	60	31	118	R365	638	R1,677	*149*	*12*	*(s)*	*161*
1990	258	1	432	84	1	39	7	13	64	31	127	R366	R638	R1,695	*135*	*12*	*(s)*	*147*
1991	244	1	439	79	1	39	6	14	63	24	117	R342	R627	R1,653	*132*	*11*	*(s)*	*143*
1992	235	4	456	81	1	45	6	14	70	28	135	R380	R649	R1,724	*137*	*10*	*(s)*	*148*
1993	233	3	464	81	1	43	6	13	68	33	114	R360	R655	R1,715	*139*	*11*	*(s)*	*150*
1994	235	7	465	81	1	46	7	14	67	31	124	R371	R668	R1,745	*148*	*11*	*(s)*	*160*
1995	233	7	490	82	1	45	7	14	67	24	114	R355	R659	R1,743	*155*	*11*	*(s)*	*166*
1996	227	3	506	86	1	46	6	14	70	24	132	R381	R678	R1,795	*158*	*12*	*(s)*	*170*
1997	224	5	506	88	1	48	7	15	68	21	138	R386	R694	R1,815	*162*	*10*	*(s)*	*172*
1998	219	8	495	88	2	39	7	14	77	16	125	R368	R706	R1,796	*150*	*10*	*(s)*	*160*
1999	208	7	474	86	1	48	7	11	81	14	130	R378	R704	R1,772	*152*	*9*	*(s)*	*161*
2000	211	7	481	87	1	56	7	11	74	17	117	R370	R719	R1,788	*153*	*8*	*(s)*	*161*
2001	204	3	439	95	2	49	6	21	77	14	132	R395	R667	R1,709	*135*	*12*	*(s)*	*147*
2002	188	7	449	88	1	54	6	22	76	13	127	R388	R654	R1,686	*131*	*13*	*(s)*	*144*
2003	190	6	430	83	2	50	6	23	76	15	140	R394	R672	R1,692	*128*	*13*	*(s)*	*141*
2004	191	16	R431	88	2	55	6	26	82	17	142	R419	R675	R1,731	*138*	*12*	*(s)*	*151*
2005	183	5	398	92	3	51	6	25	80	20	141	R417	R673	R1,675	*136*	*13*	*(s)*	*150*
2006	179	7	394	92	2	56	6	26	82	16	150	R430	R650	R1,661	*138*	*12*	*1*	*151*
2007	175	3	R406	92	1	54	6	21	80	13	148	R415	R662	R1,662	*133*	*13*	*1*	*146*
2008	168	5	407	93	(s)	42	6	17	76	14	130	R377	R642	R1,598	*126*	*13*	*1*	*140*
2009	131	-3	383	80	(s)	46	5	17	73	7	111	339	R551	R1,401	*112*	*14*	*1*	*127*
2010P	151	-1	408	84	(s)	46	6	16	62	8	121	343	583	1,485	*123*	*15*	*1*	*139*

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions in this table. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[3] Natural gas, excluding supplemental gaseous fuels.

[4] Distillate fuel oil, excluding biodiesel.

[5] Liquefied petroleum gases.

[6] Finished motor gasoline, excluding fuel ethanol.

[7] Aviation gasoline blending components, crude oil, motor gasoline blending components, pentanes plus, petrochemical feedstocks, special naphthas, still gas, unfinished oils, waxes, and miscellaneous petroleum products.

[8] Emissions from energy consumption (for electricity and a small amount of useful thermal output) in the electric power sector are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Tables 8.9 and 11.3e.

[9] Wood and wood-derived fuels.

[10] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

[11] Fuel ethanol minus denaturant.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 and greater than -0.5 million metric tons of carbon dioxide.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption, including the nonfuel use of fossil fuels. • See "Carbon Dioxide" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Pages: • See http://www.eia.gov/totalenergy/data/annual/#environment for all data beginning in 1949. • For current data, see http://www.eia.gov/totalenergy/data/monthly/#environment. • For related information, see http://www.eia.gov/environment/.

Sources: • 1949-1972—U.S. Energy Information Administration (EIA) estimates based on data in *Annual Energy Review* Tables 2.1d, 5.14b, 8.9, 10.2b, and 11.3e. • 1973 forward—EIA, *Monthly Energy Review (MER)* (April 2011), Tables 12.4 and 12.7, and MER data system calculations.

Table 11.3d Carbon Dioxide Emissions From Energy Consumption: Transportation Sector, Selected Years, 1949-2010

(Million Metric Tons of Carbon Dioxide [1])

Year	Coal	Natural Gas [3]	Petroleum								Retail Elec-tricity [7]	Total [2]	*Biomass* [2]		
			Aviation Gasoline	Distillate Fuel Oil [4]	Jet Fuel	LPG [5]	Lubricants	Motor Gasoline [6]	Residual Fuel Oil	Total			*Fuel Ethanol* [8]	*Biodiesel*	*Total*
1949	161	NA	12	30	NA	(s)	4	306	91	443	6	611	*NA*	*NA*	*NA*
1950	146	7	14	35	NA	(s)	5	332	95	481	6	640	*NA*	*NA*	*NA*
1955	39	13	24	58	21	1	6	439	80	R629	5	687	*NA*	*NA*	*NA*
1960	7	19	21	65	53	1	6	511	66	723	2	R751	*NA*	*NA*	*NA*
1965	1	27	15	80	87	2	6	597	61	847	2	878	*NA*	*NA*	*NA*
1970	1	40	7	115	141	3	5	763	60	1,093	2	1,136	*NA*	*NA*	*NA*
1975	(s)	32	5	155	145	3	6	889	56	1,258	2	R1,292	*NA*	*NA*	*NA*
1976	(s)	30	5	167	143	3	6	933	65	1,322	2	1,354	*NA*	*NA*	*NA*
1977	(s)	29	5	182	149	3	6	958	72	1,375	2	1,406	*NA*	*NA*	*NA*
1978	([9])	29	5	196	153	3	7	991	78	1,433	2	R1,464	*NA*	*NA*	*NA*
1979	([9])	32	5	213	156	1	7	941	97	R1,420	2	1,454	*NA*	*NA*	*NA*
1980	([9])	34	4	204	155	1	6	881	110	1,363	2	1,400	*NA*	*NA*	*NA*
1981	([9])	35	4	212	147	2	6	881	96	1,348	2	1,385	*(s)*	*NA*	*(s)*
1982	([9])	32	3	204	148	2	6	876	80	1,319	2	1,354	*1*	*NA*	*1*
1983	([9])	27	3	213	153	3	6	888	65	1,330	3	1,359	*2*	*NA*	*2*
1984	([9])	29	3	216	172	3	6	895	64	1,358	3	1,390	*3*	*NA*	*3*
1985	([9])	28	3	232	178	2	6	908	62	1,391	3	1,421	*3*	*NA*	*3*
1986	([9])	26	4	235	191	2	6	936	69	R1,443	3	1,472	*4*	*NA*	*4*
1987	([9])	28	3	244	202	1	6	959	71	1,487	3	1,519	*5*	*NA*	*5*
1988	([9])	34	3	265	212	1	6	981	72	1,542	3	1,579	*5*	*NA*	*5*
1989	([9])	34	3	270	218	1	6	979	77	R1,554	3	1,591	*5*	*NA*	*5*
1990	([9])	36	3	268	223	1	7	967	80	1,548	3	R1,588	*4*	*NA*	*4*
1991	([9])	33	3	263	215	1	6	962	81	R1,532	3	R1,568	*5*	*NA*	*5*
1992	([9])	32	3	269	213	1	6	979	84	R1,556	3	R1,592	*5*	*NA*	*5*
1993	([9])	34	3	278	215	1	6	1,000	71	R1,574	3	1,611	*6*	*NA*	*6*
1994	([9])	38	3	295	224	2	6	1,007	70	R1,607	3	R1,647	*7*	*NA*	*7*
1995	([9])	38	3	307	222	1	6	1,029	72	R1,639	3	R1,681	*8*	*NA*	*8*
1996	([9])	39	3	327	232	1	6	1,047	67	1,683	3	1,725	*6*	*NA*	*6*
1997	([9])	41	3	342	234	1	6	1,057	56	1,699	3	1,744	*7*	*NA*	*7*
1998	([9])	35	2	352	238	1	7	1,090	53	R1,743	3	R1,782	*8*	*NA*	*8*
1999	([9])	36	3	366	245	1	7	1,115	52	1,789	3	1,828	*8*	*NA*	*8*
2000	([9])	36	3	378	254	1	7	1,121	70	1,833	4	R1,872	*9*	*NA*	*9*
2001	([9])	35	2	387	243	1	6	1,127	46	1,813	4	R1,852	*10*	*(s)*	*10*
2002	([9])	37	2	394	237	1	6	1,158	53	R1,851	4	R1,892	*11*	*(s)*	*12*
2003	([9])	33	2	414	231	1	6	1,161	45	R1,861	R5	R1,899	*16*	*(s)*	*16*
2004	([9])	32	2	434	240	1	6	1,185	58	R1,926	5	R1,962	*20*	*(s)*	*20*
2005	([9])	33	2	444	246	2	6	1,186	66	R1,953	5	R1,991	*22*	*1*	*23*
2006	([9])	33	2	469	240	2	5	1,194	71	R1,984	5	R2,022	*30*	*2*	*33*
2007	([9])	35	2	472	238	1	6	1,201	78	R1,999	5	R2,040	*38*	*3*	*42*
2008	([9])	37	2	440	226	3	5	1,146	72	R1,895	5	R1,937	*54*	*3*	*57*
2009	([9])	R34	2	404	204	2	5	1,137	64	R1,818	5	R1,857	*61*	*3*	*64*
2010P	([9])	36	2	421	209	2	5	1,130	71	1,840	5	1,881	*73*	*2*	*75*

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions in this table. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[3] Natural gas, excluding supplemental gaseous fuels.

[4] Distillate fuel oil, excluding biodiesel.

[5] Liquefied petroleum gases.

[6] Finished motor gasoline, excluding fuel ethanol.

[7] Emissions from energy consumption (for electricity and a small amount of useful thermal output) in the electric power sector are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Tables 8.9 and 11.3e.

[8] Fuel ethanol minus denaturant.

[9] Beginning in 1978, the small amounts of coal consumed for transportation are reported as industrial sector consumption.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 million metric tons of carbon dioxide.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption, including the nonfuel use of fossil fuels. • See "Carbon Dioxide" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Pages: • See http://www.eia.gov/totalenergy/data/annual/#environment for all data beginning in 1949. • For current data, see http://www.eia.gov/totalenergy/data/monthly/#environment. • For related information, see http://www.eia.gov/environment/.

Sources: • 1949-1972—U.S. Energy Information Administration (EIA) estimates based on data in *Annual Energy Review* Tables 2.1e, 5.14c, 8.9, 10.2b, and 11.3e. • 1973 forward—EIA, *Monthly Energy Review (MER)* (April 2011), Tables 12.5 and 12.7, and MER data system calculations.

Table 11.3e Carbon Dioxide Emissions From Energy Consumption: Electric Power Sector, Selected Years, 1949-2010

(Million Metric Tons of Carbon Dioxide [1])

Year	Coal	Natural Gas [3]	Petroleum				Geo-thermal	Non-Biomass Waste [5]	Total [2]	*Biomass* [2]		
			Distillate Fuel Oil [4]	Petroleum Coke	Residual Fuel Oil	Total				*Wood* [6]	*Waste* [7]	*Total*
1949	187	30	2	NA	30	33	NA	NA	250	*1*	*NA*	*1*
1950	206	35	2	NA	35	37	NA	NA	278	*1*	*NA*	*1*
1955	324	63	2	NA	35	37	NA	NA	424	*(s)*	*NA*	*(s)*
1960	396	95	2	NA	42	43	NA	NA	535	*(s)*	*NA*	*(s)*
1965	546	127	2	NA	55	57	NA	NA	730	*(s)*	*NA*	*(s)*
1970	678	215	10	2	154	166	NA	NA	1,059	*(s)*	*(s)*	*(s)*
1975	824	172	17	(s)	231	248	NA	NA	1,244	*(s)*	*(s)*	*(s)*
1976	911	167	18	(s)	255	273	NA	NA	1,351	*(s)*	*(s)*	*(s)*
1977	962	174	21	(s)	285	306	NA	NA	1,442	*(s)*	*(s)*	*(s)*
1978	960	175	20	1	291	313	NA	NA	1,448	*(s)*	*(s)*	*(s)*
1979	1,056	192	13	1	244	258	NA	NA	1,505	*(s)*	*(s)*	*(s)*
1980	1,137	200	12	1	194	207	NA	NA	1,544	*(s)*	*(s)*	*(s)*
1981	1,180	198	9	(s)	163	173	NA	NA	1,551	*(s)*	*(s)*	*(s)*
1982	1,182	176	7	(s)	116	123	NA	NA	1,481	*(s)*	*(s)*	*(s)*
1983	1,242	158	7	1	113	121	NA	NA	1,521	*(s)*	*(s)*	*(s)*
1984	1,318	170	6	1	94	101	NA	NA	1,588	*(s)*	*(s)*	*1*
1985	1,367	166	6	1	79	86	NA	NA	1,619	*1*	*(s)*	*1*
1986	1,357	142	6	1	107	114	NA	NA	1,613	*(s)*	*(s)*	*1*
1987	1,427	155	7	1	91	99	NA	NA	1,680	*1*	*(s)*	*1*
1988	1,492	143	8	1	114	123	NA	NA	1,758	*1*	*(s)*	*1*
1989	1,519	168	11	2	121	134	(s)	4	1,826	*9*	*8*	*17*
1990	R1,548	176	7	3	92	102	(s)	6	R1,831	*12*	*11*	*23*
1991	R1,548	179	6	3	86	95	(s)	7	R1,830	*12*	*13*	*25*
1992	R1,570	186	5	5	69	79	(s)	8	R1,843	*13*	*15*	*28*
1993	R1,633	188	6	8	76	90	(s)	9	R1,919	*14*	*15*	*29*
1994	R1,639	211	9	7	68	84	(s)	9	R1,944	*14*	*16*	*30*
1995	R1,661	228	8	8	45	61	(s)	10	R1,960	*12*	*17*	*28*
1996	R1,752	205	8	8	50	66	(s)	10	R2,033	*13*	*17*	*30*
1997	R1,797	219	8	10	56	75	(s)	10	R2,101	*13*	*17*	*30*
1998	R1,828	248	10	13	82	105	(s)	10	R2,192	*13*	*17*	*30*
1999	R1,836	260	10	11	76	97	(s)	10	R2,204	*13*	*17*	*30*
2000	R1,927	281	13	10	69	91	(s)	10	R2,310	*13*	*17*	*29*
2001	R1,870	290	12	11	79	102	(s)	11	R2,273	*12*	*19*	*31*
2002	R1,890	306	9	18	52	79	(s)	13	R2,288	*14*	*21*	*35*
2003	R1,931	278	12	18	69	98	(s)	11	R2,319	*16*	*21*	*37*
2004	R1,943	297	8	23	69	100	(s)	11	R2,352	*15*	*20*	*36*
2005	R1,984	319	8	25	69	102	(s)	11	R2,417	*17*	*20*	*37*
2006	R1,954	338	5	22	28	56	(s)	12	R2,359	*17*	*21*	*38*
2007	R1,987	372	7	17	31	55	(s)	11	R2,426	*17*	*22*	*39*
2008	R1,959	362	5	16	19	40	(s)	12	R2,374	*17*	*23*	*40*
2009	R1,741	373	5	14	14	34	(s)	R11	R2,159	*17*	*24*	*41*
2010P	1,828	399	6	15	12	33	(s)	11	2,271	*18*	*23*	*41*

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Carbon dioxide emissions from biomass energy consumption are excluded from total emissions in this table. See Note, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section.

[3] Natural gas, excluding supplemental gaseous fuels.

[4] Distillate fuel oil, excluding biodiesel.

[5] Municipal solid waste from non-biogenic sources, and tire-derived fuels.

[6] Wood and wood-derived fuels.

[7] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 million metric tons of carbon dioxide.

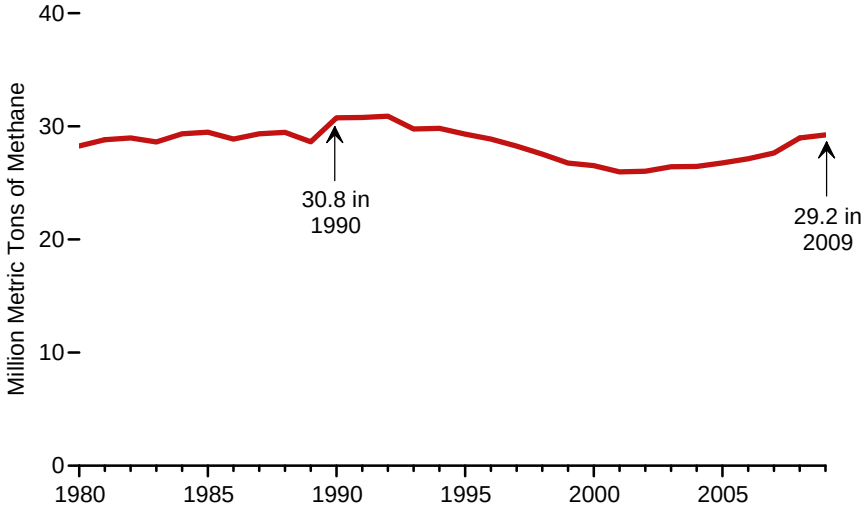
Notes: • Data are estimates for carbon dioxide emissions from energy consumption. • See "Carbon Dioxide" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Pages: • See http://www.eia.gov/totalenergy/data/annual/#environment for all data beginning in 1949. • For current data, see http://www.eia.gov/totalenergy/data/monthly/#environment. • For related information, see http://www.eia.gov/environment/.

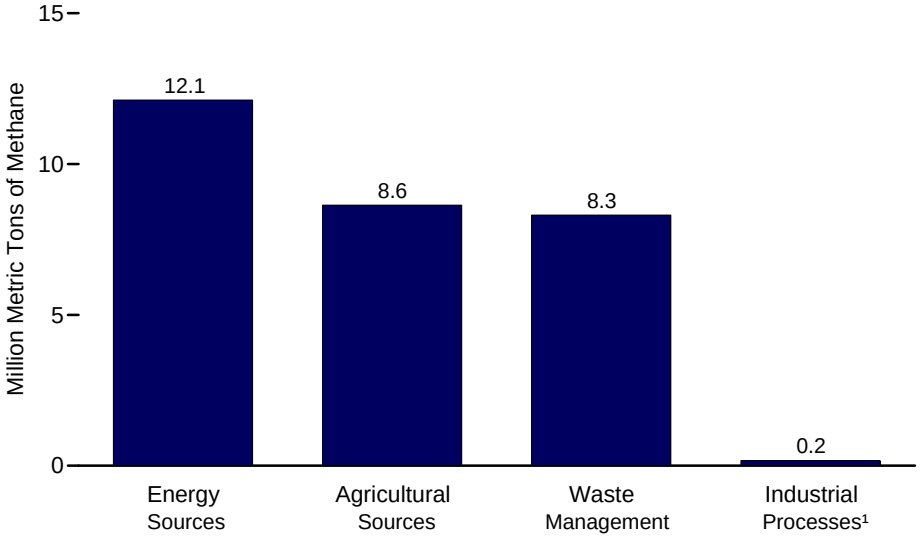
Sources: • 1949-1972—U.S. Energy Information Administration (EIA) estimates based on data in *Annual Energy Review* Tables 2.1f, 5.14c, and 10.2c. • 1973 forward—EIA, *Monthly Energy Review (MER)* (April 2011), Table 12.6 and MER data system calculations.

Figure 11.4 Methane Emissions

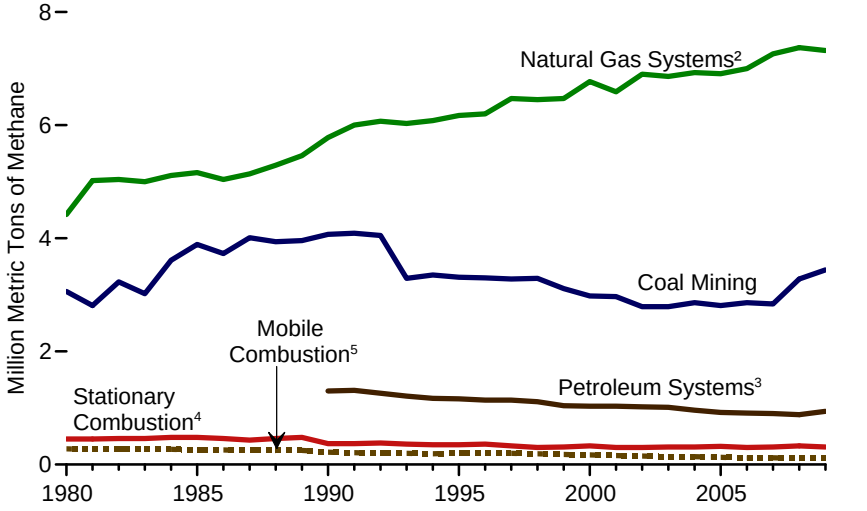
Total, 1980-2009



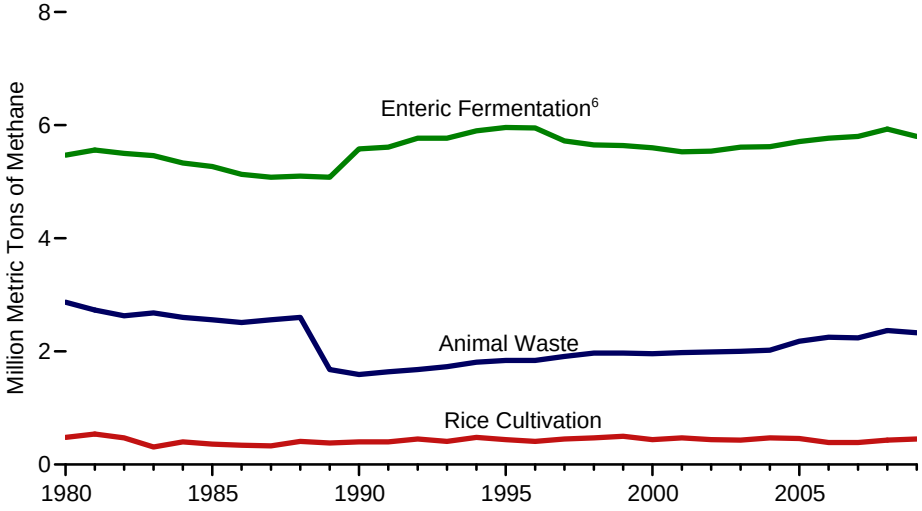
By Source, 2009



Energy Sources by Type 1980-2009



Agricultural Sources by Major Type, 1980-2009



[1] Chemical production, and iron and steel production.
[2] Natural gas production, processing, and distribution.
[3] Petroleum production, refining, and distribution.
[4] Consumption of coal, petroleum, natural gas, and wood for heat or electricity.
[5] Emissions from passenger cars, trucks, buses, motorcycles, and other transport.
[6] Methane emitted as a product of digestion in animals such as cattle, sheep, goats, and swine.

Source: Table 11.4.

Table 11.4 Methane Emissions, 1980-2009

(Million Metric Tons of Methane)

Year	Energy Sources						Waste Management			Agricultural Sources					Industrial Processes [9]	Total [5]
	Coal Mining	Natural Gas Systems [1]	Petroleum Systems [2]	Mobile Combustion [3]	Stationary Combustion [4]	Total [5]	Landfills	Wastewater Treatment [6]	Total [5]	Enteric Fermentation [7]	Animal Waste [8]	Rice Cultivation	Crop Residue Burning	Total [5]		
1980	3.06	R4.42	NA	0.28	0.45	R8.20	10.52	0.52	11.04	5.47	R2.87	0.48	0.04	R8.86	0.17	R28.27
1981	2.81	R5.02	NA	.27	.45	R8.55	10.69	.53	11.22	5.56	R2.73	.54	.05	R8.88	.18	R28.82
1982	3.23	R5.04	NA	.27	.46	R9.01	R10.63	.54	11.17	5.50	R2.63	.47	.05	R8.65	.13	R28.97
1983	3.02	R5.00	NA	.27	.46	R8.76	10.67	.54	11.21	5.46	R2.68	.31	R.04	R8.49	.15	R28.62
1984	3.61	R5.11	NA	.27	.48	R9.46	10.68	.66	R11.33	5.33	R2.60	.40	R.05	R8.38	R.16	R29.34
1985	3.89	R5.16	NA	.26	.48	R9.79	10.65	.67	11.32	5.27	R2.56	.36	R.05	R8.23	R.15	R29.49
1986	3.73	R5.04	NA	.26	R.46	R9.48	10.53	.67	R11.20	5.13	R2.51	.34	.04	R8.02	.16	R28.87
1987	4.01	R5.14	NA	.25	.43	R9.85	10.63	.68	11.31	5.08	R2.56	.33	.04	R8.02	.17	R29.34
1988	3.94	R5.29	NA	.25	.46	R9.95	R10.51	.69	R11.20	5.10	R2.60	.41	R.05	R8.14	R.18	R29.47
1989	3.96	R5.46	NA	.25	.48	R10.15	R10.43	.70	11.13	5.08	R1.68	.38	R.05	R7.18	.18	R28.64
1990	R4.07	R5.78	1.30	R.22	.37	R11.72	R10.31	.91	R11.23	R5.58	R1.59	.40	R.05	R7.62	.18	R30.75
1991	4.09	R6.00	1.31	R.21	.37	R11.98	R10.00	.93	R10.93	R5.61	R1.64	.40	R.05	R7.69	.19	R30.78
1992	4.05	R6.07	1.26	R.20	.38	R11.97	R9.84	.95	R10.79	R5.77	R1.68	.45	R.05	R7.95	.19	R30.90
1993	R3.29	R6.03	1.21	R.20	.36	11.08	R9.58	.96	R10.54	R5.77	R1.73	.41	.04	R7.96	.20	R29.77
1994	R3.35	R6.08	1.17	R.19	.35	R11.15	R9.25	.98	R10.23	R5.90	R1.81	.48	.05	R8.23	.21	R29.82
1995	R3.31	R6.17	R1.16	R.20	.35	R11.20	R8.62	1.00	R9.61	R5.96	R1.84	.44	R.05	R8.28	.22	R29.31
1996	R3.30	R6.20	1.14	R.20	.36	R11.20	R8.19	1.01	R9.19	R5.95	R1.84	.41	R.05	R8.25	R.22	R28.87
1997	R3.28	R6.47	1.14	R.20	.33	R11.42	R7.45	1.02	R8.47	R5.72	R1.91	.45	.05	R8.13	R.23	R28.26
1998	R3.29	R6.45	1.11	R.19	.30	R11.34	R6.80	1.03	R7.83	R5.65	R1.97	.47	.05	R8.14	R.23	R27.54
1999	3.11	R6.47	1.04	R.18	.31	R11.11	R6.21	1.05	R7.25	R5.64	R1.97	.50	.05	R8.16	R.24	R26.76
2000	R2.98	R6.77	1.03	R.17	.33	R11.27	R5.93	1.05	R6.98	R5.60	R1.96	.44	.05	R8.05	R.22	R26.53
2001	R2.97	R6.59	1.03	R.16	.30	R11.05	R5.65	1.05	R6.70	R5.53	R1.98	.47	.05	R8.02	.20	R25.97
2002	2.79	R6.90	1.02	R.15	.30	R11.16	R5.58	1.06	R6.64	R5.54	R1.99	.44	R.05	R8.03	.21	R26.03
2003	2.79	R6.86	1.01	R.14	.31	R11.11	R5.97	1.06	R7.03	R5.61	R2.00	.43	.05	R8.08	R.20	R26.43
2004	R2.86	R6.93	.96	R.14	R.31	R11.20	R5.80	1.07	R6.88	R5.62	R2.02	.47	.05	R8.16	R.22	R26.46
2005	2.81	R6.91	.92	R.13	.32	R11.08	R6.02	1.08	R7.09	R5.71	R2.18	.46	.05	R8.40	.20	R26.77
2006	R2.86	R7.00	.91	R.12	.30	R11.19	R6.18	1.10	R7.27	R5.77	R2.25	.39	.05	R8.47	R.20	R27.14
2007	2.84	R7.26	.90	R.12	.31	R11.43	R6.40	1.11	R7.51	R5.80	R2.24	.39	.05	R8.49	.21	R27.64
2008	3.28	R7.37	.88	R.11	R.33	R11.97	R6.90	R1.12	R8.02	R5.93	R2.37	R.43	.05	R8.79	R.18	R28.97
2009	3.44	7.32	.94	.11	.31	12.12	7.19	1.12	8.31	5.80	2.33	.45	.06	8.64	.17	29.24

[1] Natural gas production, processing, and distribution; processing is not included in 1980 and is incompletely covered in 1981-1989.

[2] Petroleum production, refining, and distribution.

[3] Emissions from passenger cars, trucks, buses, motorcycles, and other transport.

[4] Consumption of coal, petroleum, natural gas, and wood for heat or electricity.

[5] See notes on components for specific coverage, which is inconsistent prior to 1990 in some cases.

[6] 1980-1983, domestic wastewater only; 1984 forward, industrial and domestic wastewater.

[7] Methane emitted as a product of digestion in animals such as cattle, sheep, goats, and swine.

[8] Estimation methods for 1990 forward reflect a shift in waste management away from liquid systems to dry-lot systems, thus lowering emissions.

[9] Chemical production, and iron and steel production.

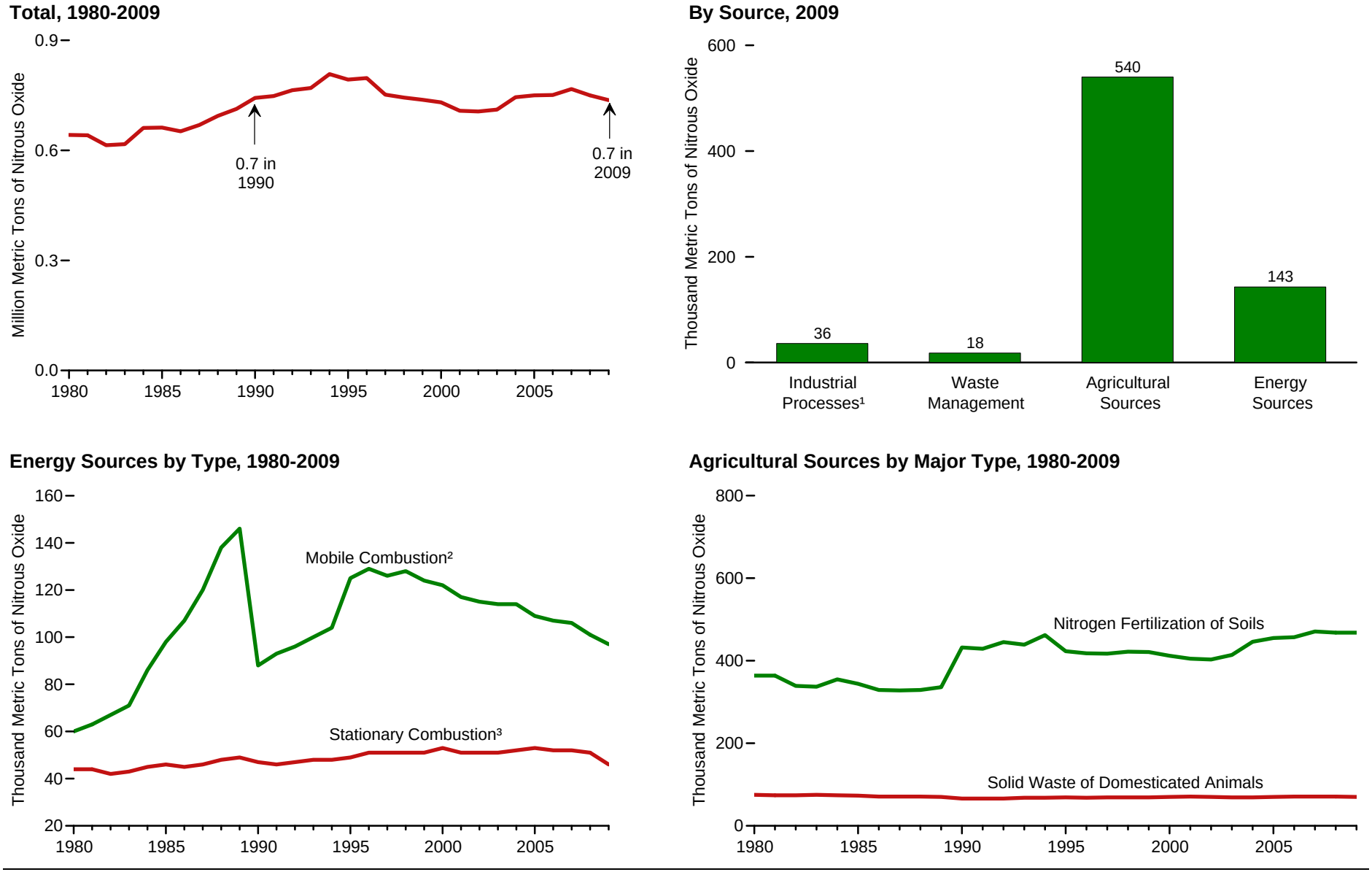
R=Revised. NA=Not available.

Notes: • Emissions are from anthropogenic sources. "Anthropogenic" means produced as the result of human activities, including emissions from agricultural activity and domestic livestock. Emissions from natural sources, such as wetlands and wild animals, are not included. • Under certain conditions, methane may be produced via anaerobic decomposition of organic materials in landfills, animal wastes, and rice paddies. • Because of the continuing goal to improve estimation methods for greenhouse gases, data are frequently revised on an annual basis in keeping with the latest findings of the international scientific community. • Totals may not equal sum of components due to independent rounding.

Web Page: For related information, see http://www.eia.gov/environment/.

Sources: U.S. Energy Information Administration (EIA), *Emissions of Greenhouse Gases in the United States 2009* (March 2011), Tables 17-21; and EIA estimates based on the Intergovernmental Panel on Climate Change's *Guidelines for National Greenhouse Gas Inventories* (2006 and revised 1996 guidelines)—see http://www.ipcc-nggip.iges.or.jp/public/gl/invs6.html; and the U.S. Environmental Protection Agency's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2008* (April 2010)—see http://www.epa.gov/climatechange/emissions/usinventoryreport.html.

Figure 11.5 Nitrous Oxide Emissions



[1] Adipic acid production (primarily for the manufacture of nylon fibers and plastics) and nitric acid production (primarily for fertilizers).

[2] Emissions from passenger cars and trucks; air, rail, and marine transportation; and farm and construction equipment.

[3] Consumption of coal, petroleum, natural gas, and wood for heat or electricity.

Source: Table 11.5.

Table 11.5 Nitrous Oxide Emissions, 1980-2009

(Thousand Metric Tons of Nitrous Oxide)

Year	Energy Sources			Waste Management			Agricultural Sources				Industrial Processes [3]	Total
	Mobile Combustion [1]	Stationary Combustion [2]	Total	Waste Combustion	Human Sewage in Wastewater	Total	Nitrogen Fertilization of Soils	Crop Residue Burning	Solid Waste of Domesticated Animals	Total		
1980	60	44	104	1	R10	R11	R364	1	R75	R440	88	R642
1981	63	44	106	1	R10	R11	R364	2	R74	R440	R84	R641
1982	67	42	108	1	R10	R11	R339	2	R74	R414	R80	R614
1983	71	43	114	1	R11	R11	R337	1	R75	R413	R79	R617
1984	86	45	132	1	R11	R11	R355	R2	R74	R431	R87	R661
1985	98	46	143	1	R11	R12	R344	2	R73	R419	R88	R662
1986	107	45	152	1	R11	R12	R329	R2	R71	R402	R86	R652
1987	120	46	166	1	R12	R13	R328	1	R71	R400	R90	R669
1988	138	48	185	1	R12	R13	R329	1	R71	R401	R95	R694
1989	146	49	R195	1	R12	R13	R336	1	R70	R407	R98	R713
1990	R88	47	R135	1	R12	R13	R432	1	R66	R499	96	R743
1991	R93	46	R139	1	R13	R14	R429	1	R66	R497	R98	R748
1992	R96	47	R143	1	R13	R14	R445	2	R66	R512	95	R764
1993	R100	48	R148	1	R13	R14	R439	1	R68	R508	100	R770
1994	R104	48	R152	1	R13	R15	R462	2	R68	R532	110	R808
1995	R125	49	R174	1	R13	R15	R423	1	R69	R494	R110	R793
1996	R129	51	R180	1	R14	R15	R418	2	R68	R487	R115	R797
1997	R126	51	R178	1	R14	R15	R417	2	R69	R487	R72	R752
1998	R128	51	R179	1	R14	R15	R422	2	R69	R493	R57	R744
1999	R124	51	R175	1	R15	R16	R421	2	R69	R492	R56	R738
2000	R122	53	R175	1	R15	R16	R412	2	R70	R484	56	R731
2001	R117	51	R168	1	R15	R16	R405	2	R71	R477	R46	R708
2002	R115	51	R166	1	R15	R16	R403	2	R70	R474	R50	R706
2003	R114	51	R165	1	R15	R16	R414	2	R69	R485	R45	R711
2004	R114	52	R167	1	R15	R17	R446	2	R69	R517	R45	R745
2005	R109	53	R162	1	R16	R17	R455	2	R70	R526	R45	R750
2006	R107	52	R159	1	R16	R17	R457	2	R71	R530	R46	R751
2007	R106	52	R159	1	R16	R17	R471	2	R71	R544	R47	R767
2008	R101	51	R151	1	R16	R17	R468	2	R71	R541	R41	R750
2009	97	46	143	1	16	18	468	2	70	540	36	737

[1] Emissions from passenger cars and trucks; air, rail, and marine transportation; and farm and construction equipment.

[2] Consumption of coal, petroleum, natural gas, and wood for heat or electricity.

[3] Adipic acid production (primarily for the manufacture of nylon fibers and plastics), and nitric acid production (primarily for fertilizers).

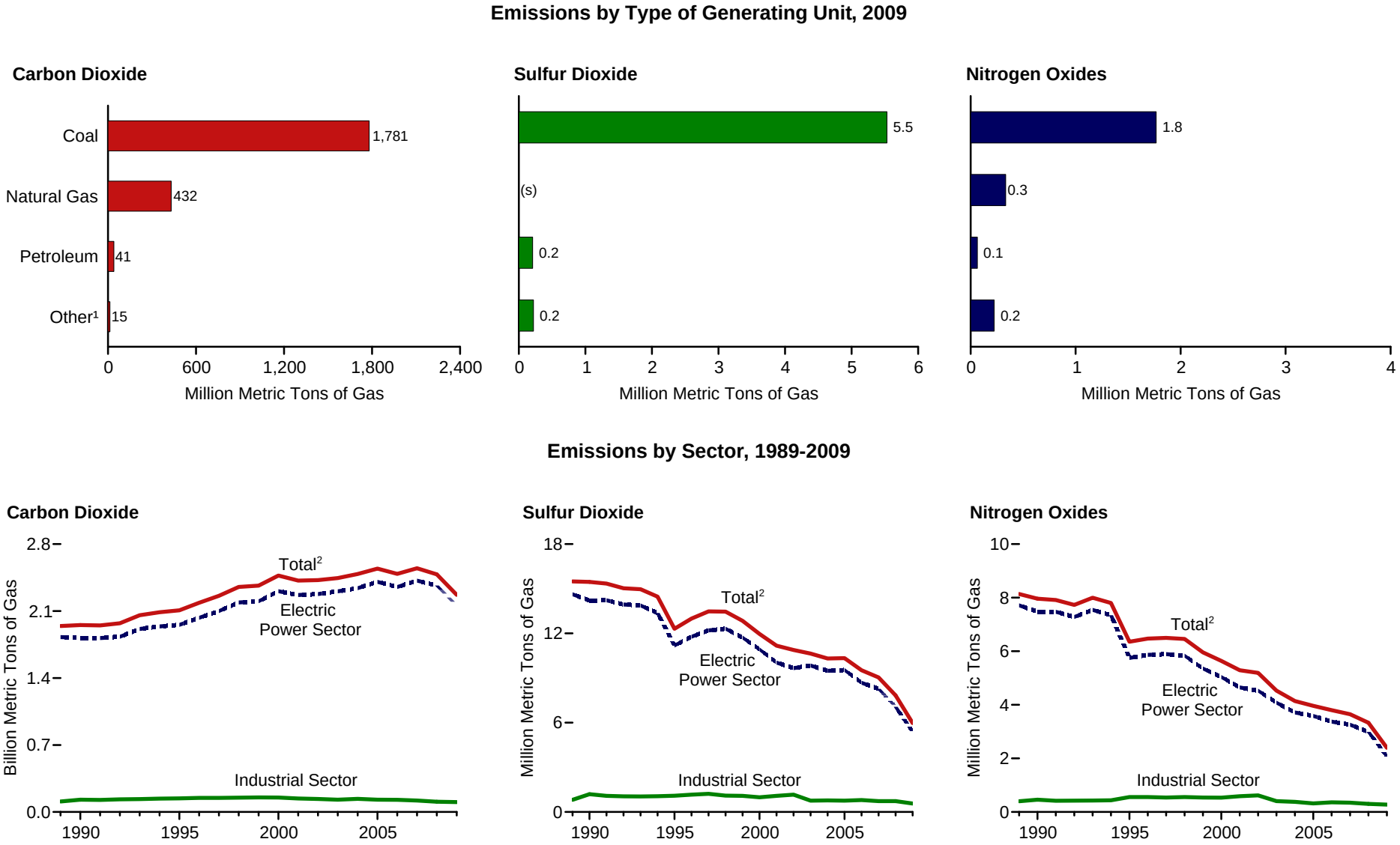
R=Revised.

Notes: • Emissions are from anthropogenic sources. "Anthropogenic" means produced as the result of human activities, including emissions from agricultural activity and domestic livestock. Emissions from natural sources, such as wetlands and wild animals, are not included. • Because of the continuing goal to improve estimation methods for greenhouse gases, data are frequently revised on an annual basis in keeping with the latest findings of the international scientific community. • Totals may not equal sum of components due to independent rounding.

Web Page: For related information, see http://www.eia.gov/environment/.

Sources: U.S. Energy Information Administration (EIA), *Emissions of Greenhouse Gases in the United States 2009* (March 2011), Table 22; and EIA estimates based on the Intergovernmental Panel on Climate Change's *Guidelines for National Greenhouse Gas Inventories* (2006 and revised 1996 guidelines)—see http://www.ipcc-nggip.iges.or.jp/public/gl/invs6.html; and the U.S. Environmental Protection Agency's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2008* (April 2010)—see http://www.epa.gov/climatechange/emissions/usinventoryreport.html.

Figure 11.6 Emissions From Energy Consumption for Electricity Generation and Useful Thermal Output



¹ For carbon dioxide: municipal solid waste from non-biogenic sources; tire-derived fuel, and geothermal. For sulfur dioxide and nitrogen oxides: blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels; wood and wood-derived fuels; municipal solid waste, landfill gas, sludge waste, tires, agricultural byproducts, and other biomass; and chemicals, hydrogen, pitch, sulfur, and tar coal.

² Includes Commercial Sector.
(s)=Less than 0.05 million metric tons.
Sources: Tables 11.6a-11.6c.

Table 11.6a Emissions From Energy Consumption for Electricity Generation and Useful Thermal Output: Total (All Sectors), 1989-2009 (Sum of Tables 11.6b and 11.6c; Thousand Metric Tons of Gas)

Year	Carbon Dioxide [1]						Sulfur Dioxide					Nitrogen Oxides				
	Coal [2]	Natural Gas [3]	Petroleum [4]	Geo-thermal [5]	Non-Biomass Waste [6]	Total	Coal [2]	Natural Gas [3]	Petroleum [4]	Other [7]	Total	Coal [2]	Natural Gas [3]	Petroleum [4]	Other [7]	Total
1989	R1,573,566	R218,384	R145,399	363	R5,590	R1,943,302	14,469	1	984	39	15,493	7,281	495	269	93	8,136
1990	R1,592,395	R233,852	R119,580	384	R7,488	R1,953,699	14,281	1	937	243	15,462	7,119	513	208	122	7,961
1991	R1,592,186	R238,084	R111,351	398	R8,447	R1,950,466	14,240	1	856	246	15,342	7,109	498	193	113	7,913
1992	R1,617,034	R248,149	R96,638	400	R10,053	R1,972,275	14,060	1	704	264	15,030	6,975	477	158	119	7,728
1993	R1,687,623	R250,411	R108,164	415	R10,439	R2,057,053	13,843	1	851	271	14,966	7,225	475	173	124	7,997
1994	R1,697,416	R276,308	R102,844	384	R11,186	R2,088,138	13,398	1	794	279	14,472	7,005	513	159	124	7,801
1995	R1,720,062	298,601	R77,032	329	R11,982	R2,108,006	11,188	2	826	298	12,314	5,136	653	332	234	6,355
1996	R1,812,022	277,856	R84,024	360	R12,718	R2,186,980	11,811	1	876	304	12,991	5,307	577	352	238	6,474
1997	R1,858,944	293,139	R93,497	374	R13,368	R2,259,322	12,211	1	965	303	13,480	5,322	619	326	233	6,500
1998	R1,887,335	327,456	R123,542	375	R12,891	R2,351,600	12,012	1	1,162	289	13,464	5,123	700	395	241	6,459
1999	R1,894,211	343,090	R115,677	381	R12,943	R2,366,302	11,453	1	1,101	288	12,843	4,687	632	391	245	5,955
2000	R1,986,100	363,526	R108,407	362	R12,440	R2,470,834	10,729	1	933	300	11,963	4,370	614	404	250	5,638
2001	R1,920,901	367,146	R117,196	353	R13,010	R2,418,607	9,905	2	1,002	265	11,174	4,096	631	294	268	5,290
2002	R1,938,613	378,950	R91,110	372	R14,918	R2,423,963	9,786	2	773	321	10,881	4,057	625	225	287	5,194
2003	R1,973,597	345,119	R112,065	371	R13,943	R2,445,094	9,688	2	717	239	10,646	3,607	453	240	232	4,532
2004	R1,989,580	367,112	R115,726	381	R14,183	R2,486,982	9,437	2	633	237	10,309	3,286	416	225	217	4,143
2005	R2,028,614	383,461	R117,086	377	R14,299	R2,543,838	9,499	2	587	251	10,340	3,135	383	221	222	3,961
2006	R2,001,085	404,278	R67,988	374	R15,193	R2,488,918	8,867	2	427	227	9,524	2,996	399	164	240	3,799
2007	R2,029,804	434,536	R67,769	376	R14,548	R2,547,032	8,389	3	422	227	9,042	2,870	382	157	242	3,650
2008	R2,001,806	R419,599	R47,855	R381	R14,370	R2,484,012	7,351	3	250	225	7,830	2,680	351	75	225	3,330
2009	1,781,278	432,206	41,474	386	14,163	2,269,508	5,535	2	210	223	5,970	1,769	336	66	225	2,395

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.
[2] Anthracite, bituminous coal, subbituminous coal, lignite, waste coal, and synthetic coal.
[3] Natural gas, plus a small amount of supplemental gaseous fuels.
[4] Distillate fuel oil, residual fuel oil, petroleum coke, jet fuel, kerosene, other petroleum, and waste oil.
[5] Carbon dioxide in geothermal steam.
[6] Municipal solid waste from non-biogenic sources, and tire-derived fuel.
[7] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels; wood and wood-derived fuels; municipal solid waste, landfill gas, sludge waste, tires, agricultural byproducts, and other biomass; and chemicals, hydrogen, pitch, sulfur, and tar coal.

R=Revised.

Notes: • Data are for emissions from energy consumption for electricity generation and useful thermal output. • See "Useful Thermal Output" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Page: For related information, see http://www.eia.gov/electricity/.

Sources: Tables 11.6b and 11.6c.

Table 11.6b Emissions From Energy Consumption for Electricity Generation and Useful Thermal Output: Electric Power Sector, 1989-2009 (Subset of Table 11.6a; Thousand Metric Tons of Gas)

Year	Carbon Dioxide [1]						Sulfur Dioxide					Nitrogen Oxides				
	Coal [2]	Natural Gas [3]	Petroleum [4]	Geo-thermal [5]	Non-Biomass Waste [6]	Total	Coal [2]	Natural Gas [3]	Petroleum [4]	Other [7]	Total	Coal [2]	Natural Gas [3]	Petroleum [4]	Other [7]	Total
1989	R1,520,230	R169,653	R133,546	363	R4,366	R1,828,158	13,815	1	810	7	14,633	7,055	390	246	25	7,717
1990	R1,534,141	R177,232	R101,800	384	R5,795	R1,819,351	13,576	1	628	13	14,218	6,878	390	175	36	7,480
1991	R1,534,559	R180,541	R95,149	398	R7,207	R1,817,854	13,590	1	621	15	14,227	6,886	384	165	42	7,476
1992	R1,556,741	R187,730	R79,153	400	R8,476	R1,832,501	13,375	1	559	12	13,946	6,749	359	128	46	7,282
1993	R1,626,161	R188,291	R90,400	415	R8,592	R1,913,860	13,133	1	735	13	13,882	6,996	357	143	49	7,544
1994	R1,634,282	R211,154	R85,005	384	R9,323	R1,940,148	12,695	1	665	11	13,373	6,777	390	128	47	7,343
1995	R1,656,743	228,675	R61,057	329	R10,015	R1,956,819	10,573	1	581	34	11,189	4,974	402	282	95	5,754
1996	R1,747,945	205,250	R66,113	360	R9,932	R2,029,599	11,129	1	617	32	11,779	5,144	326	301	96	5,866
1997	R1,794,629	220,174	R75,079	374	R10,372	R2,100,628	11,515	1	653	36	12,205	5,157	370	269	98	5,894
1998	R1,825,027	249,836	R105,539	375	R10,264	R2,191,041	11,373	1	911	37	12,321	4,965	431	337	103	5,836
1999	R1,831,670	262,455	R97,892	381	R10,312	R2,202,710	10,843	1	836	42	11,722	4,535	381	332	109	5,357
2000	R1,923,054	283,034	R92,226	362	R10,178	R2,308,855	10,140	1	746	45	10,932	4,225	338	367	111	5,040
2001	R1,862,800	291,101	R102,900	353	R10,900	R2,268,054	9,281	2	754	5	10,041	3,878	425	253	96	4,652
2002	R1,878,923	307,455	R78,820	372	R12,758	R2,278,328	9,106	2	549	16	9,672	3,813	425	187	104	4,528
2003	R1,917,303	279,300	R98,208	371	R11,453	R2,306,635	9,255	2	579	13	9,849	3,496	282	207	98	4,082
2004	R1,929,818	297,782	R100,236	381	R11,177	R2,339,394	8,991	2	493	9	9,495	3,183	241	193	101	3,717
2005	R1,970,908	320,545	R102,537	377	R11,257	R2,405,625	9,071	2	461	10	9,543	3,051	243	189	103	3,585
2006	R1,944,759	339,557	R55,358	374	R11,544	R2,351,592	8,416	2	264	8	8,690	2,902	230	135	107	3,374
2007	R1,977,528	373,268	R55,545	376	R11,304	R2,418,022	8,002	3	265	9	8,279	2,781	236	130	112	3,259
2008	R1,951,138	363,749	R40,442	R381	R11,620	R2,367,331	6,909	2	146	8	7,065	2,578	230	58	124	2,990
2009	1,736,284	374,082	33,700	386	11,256	2,155,707	5,253	2	110	9	5,374	1,688	214	50	128	2,080

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

[2] Anthracite, bituminous coal, subbituminous coal, lignite, waste coal, and synthetic coal.

[3] Natural gas, plus a small amount of supplemental gaseous fuels.

[4] Distillate fuel oil, residual fuel oil, petroleum coke, jet fuel, kerosene, other petroleum, and waste oil.

[5] Carbon dioxide in geothermal steam.

[6] Municipal solid waste from non-biogenic sources, and tire-derived fuel.

[7] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels; wood and wood-derived fuels; municipal solid waste, landfill gas, sludge waste, tires, agricultural byproducts, and other biomass; and chemicals, hydrogen, pitch, sulfur, and tar coal.

R=Revised.

Notes: • There are small differences in carbon dioxide emissions values between this table and Table 11.3e due to differences in the methodologies for calculating the data. • Data are for emissions from energy consumption for electricity generation and useful thermal output. • The electric power sector comprises electricity-only and combined-heat-and-power (CHP) plants within the NAICS 22 category whose primary business is to sell electricity, or electricity and heat, to the public. • See Table 11.6c for commercial and industrial CHP and electricity-only data. • See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 8. • See "Useful Thermal Output" in Glossary. • Totals may not equal sum of components due to independent rounding.

Web Page: For related information, see http://www.eia.gov/electricity/.

Sources: **Carbon Dioxide:** U.S. Energy Information Administration (EIA) estimates based on Form EIA-923, "Power Plant Operations Report" (and predecessor forms). **Sulfur Dioxide** and **Nitrogen Oxides:** EIA estimates based on Form EIA-923, "Power Plant Operations Report" (and predecessor forms). Data were adjusted by the U.S. Environmental Protection Agency's Continuous Emissions Monitoring System.

Table 11.6c Emissions From Energy Consumption for Electricity Generation and Useful Thermal Output: Commercial and Industrial Sectors, 1989-2009 (Subset of Table 11.6a; Thousand Metric Tons of Gas)

Year	Carbon Dioxide [1]						Sulfur Dioxide					Nitrogen Oxides				
	Coal [2]	Natural Gas [3]	Petroleum [4]	Geo-thermal [5]	Non-Biomass Waste [6]	Total	Coal [2]	Natural Gas [3]	Petroleum [4]	Other [7]	Total	Coal [2]	Natural Gas [3]	Petroleum [4]	Other [7]	Total
	Commercial Sector [8]															
1989	R2,320	1,542	637	–	804	R5,303	37	(s)	5	1	43	9	3	2	3	17
1990	R2,418	2,294	706	–	959	R6,377	39	(s)	4	1	45	10	6	1	4	21
1991	R2,680	2,287	544	–	1,014	R6,526	32	(s)	3	1	35	10	6	1	4	21
1992	R2,552	2,787	474	–	1,258	R7,070	32	(s)	3	1	35	10	7	1	4	21
1993	R2,988	3,315	616	–	1,285	R8,205	40	(s)	3	1	44	12	7	1	4	24
1994	R2,932	3,722	654	–	1,292	R8,601	39	(s)	3	(s)	42	11	8	1	4	24
1995	R3,106	4,070	509	–	1,462	R9,147	30	(s)	3	3	35	8	20	6	11	45
1996	R3,639	4,369	534	–	2,023	R10,565	40	(s)	3	4	47	9	23	4	14	50
1997	R3,871	4,654	R716	–	R2,277	R11,518	43	(s)	3	6	51	10	34	7	14	65
1998	R3,341	4,707	R829	–	R2,081	R10,958	37	(s)	5	4	45	10	35	5	16	66
1999	R3,468	4,535	742	–	2,008	R10,752	34	(s)	4	4	42	9	28	4	17	57
2000	R3,635	4,605	740	–	1,684	R10,665	33	(s)	4	7	43	8	38	4	16	65
2001	R3,366	4,280	839	–	1,418	R9,903	43	(s)	4	2	48	13	19	2	16	50
2002	R3,025	4,035	571	–	1,520	R9,151	41	(s)	2	2	46	13	20	2	13	48
2003	R3,904	3,222	683	–	1,706	R9,515	32	(s)	3	1	36	9	16	5	15	45
2004	R4,018	3,916	920	–	1,962	R10,817	30	(s)	3	2	35	8	18	8	16	49
2005	R4,031	3,701	759	–	1,897	R10,387	33	(s)	3	1	36	9	24	6	15	54
2006	R3,908	3,686	445	–	1,946	R9,984	33	(s)	3	1	36	9	35	3	17	64
2007	R3,994	3,800	363	–	1,635	R9,792	33	(s)	3	1	37	10	16	2	16	44
2008	R4,155	R3,589	310	–	1,953	R10,006	32	(s)	1	(s)	33	9	14	1	16	40
2009	3,727	4,093	245	–	2,084	10,149	26	(s)	1	(s)	27	8	13	1	16	39
	Industrial Sector [9]															
1989	R51,017	R47,188	R11,216	–	420	R109,842	616	(s)	169	32	817	218	100	21	63	403
1990	R55,837	R54,326	R17,074	–	734	R127,971	666	(s)	304	229	1,199	233	116	31	80	461
1991	R54,947	R55,255	R15,659	–	225	R126,086	618	(s)	232	230	1,080	215	108	27	66	416
1992	R57,742	R57,632	R17,010	–	319	R132,704	655	(s)	143	251	1,049	218	110	29	67	425
1993	R58,474	R58,805	R17,148	–	R562	R134,988	671	(s)	113	257	1,041	219	110	29	70	429
1994	R60,202	R61,431	R17,186	–	R571	R139,390	664	(s)	126	267	1,057	219	114	30	71	435
1995	R60,212	65,856	R15,466	–	R505	R142,040	585	(s)	243	262	1,090	154	231	43	128	556
1996	R60,438	68,237	R17,377	–	R763	R146,815	642	(s)	256	268	1,166	154	228	48	128	558
1997	R60,444	68,311	R17,701	–	R719	R147,175	653	(s)	309	261	1,223	155	215	50	121	541
1998	R58,967	72,914	R17,174	–	R546	R149,601	603	(s)	247	248	1,099	148	234	53	121	557
1999	R59,073	76,100	R17,043	–	R624	R152,840	576	(s)	260	243	1,080	144	223	55	120	541
2000	R59,410	75,887	R15,440	–	R577	R151,315	556	(s)	184	248	988	138	238	34	123	533
2001	R54,735	71,765	R13,457	–	R693	R140,650	581	(s)	245	259	1,085	206	187	39	156	587
2002	R56,665	67,460	R11,719	–	R640	R136,484	639	(s)	221	303	1,163	231	181	36	170	618
2003	R52,390	62,598	R13,173	–	783	R128,944	401	(s)	135	224	761	102	155	28	119	404
2004	R55,744	65,413	R14,570	–	R1,044	R136,771	415	(s)	136	227	779	95	157	25	100	376
2005	R53,675	59,216	R13,791	–	R1,145	R127,826	395	(s)	124	241	760	75	117	27	104	322
2006	R52,418	61,035	R12,185	–	R1,703	R127,341	419	(s)	161	218	798	86	134	26	117	362
2007	R48,282	57,467	R11,860	–	R1,609	R119,218	353	1	154	217	726	79	129	26	113	346
2008	R46,514	52,261	R7,103	–	R798	R106,675	411	1	103	217	731	93	107	16	84	300
2009	41,268	54,031	7,529	–	824	103,651	256	(s)	98	214	569	73	108	15	81	277

[1] Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.
[2] Anthracite, bituminous coal, subbituminous coal, lignite, waste coal, and synthetic coal.
[3] Natural gas, plus a small amount of supplemental gaseous fuels.
[4] Distillate fuel oil, residual fuel oil, petroleum coke, jet fuel, kerosene, other petroleum, and waste oil.
[5] Carbon dioxide in geothermal steam.
[6] Municipal solid waste from non-biogenic sources, and tire-derived fuel.
[7] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels; wood and wood-derived fuels; municipal solid waste, landfill gas, sludge waste, tires, agricultural byproducts, and other biomass; and chemicals, hydrogen, pitch, sulfur, and tar coal.
[8] Commercial combined-heat-and-power (CHP) and commercial electricity-only plants.
[9] Industrial combined-heat-and-power (CHP) and industrial electricity-only plants.

R=Revised. – =No data reported. (s)=Less than 0.5 thousand metric tons.

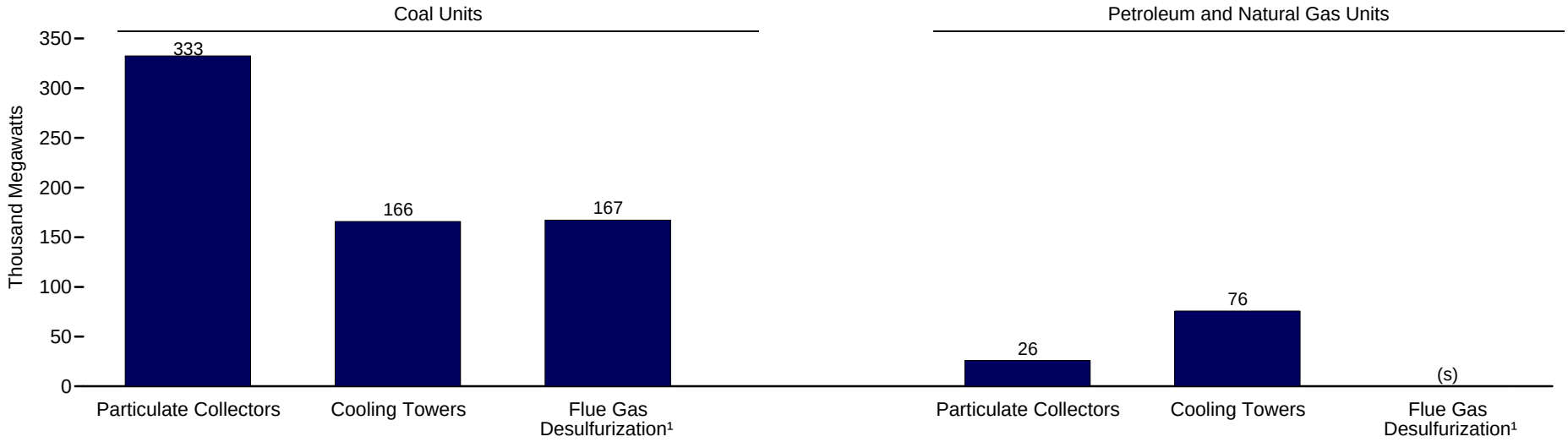
Notes: • Data are for emissions from energy consumption for electricity generation and useful thermal output. • See Table 11.6b for electric power sector data. • See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 8. • See "Useful Thermal Output" in Glossary. • Totals may not equal sums of components due to independent rounding.

Web Page: For related information, see http://www.eia.gov/electricity/.

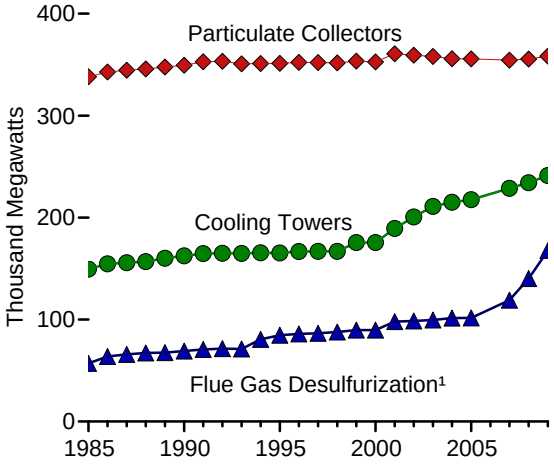
Sources: **Carbon Dioxide:** U.S. Energy Information Administration (EIA) estimates based on Form EIA-923, "Power Plant Operations Report" (and predecessor forms). **Sulfur Dioxide** and **Nitrogen Oxides:** EIA estimates based on Form EIA-923, "Power Plant Operations Report" (and predecessor forms). Data were adjusted by the U.S. Environmental Protection Agency's Continuous Emissions Monitoring System.

Figure 11.7 Installed Nameplate Capacity of Fossil-Fuel Steam-Electric Generators With Environmental Equipment

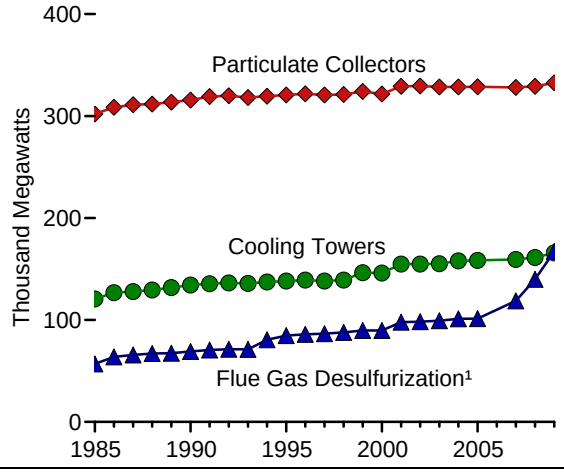
By Fuel and Equipment Type, 2009



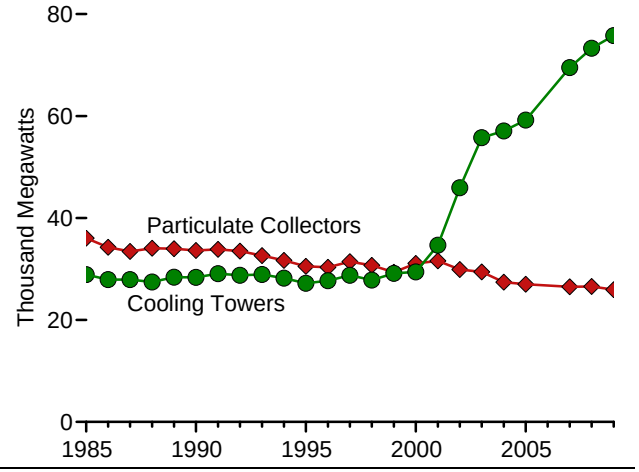
Total Units by Equipment Type, 1985-2009[2]



Coal Units by Equipment Type, 1985-2009[2]



Petroleum and Natural Gas Units by Equipment Type, 1985-2009[2]



[1] Also called "scrubbers."

[2] Through 2000, data are for electric utility plants with fossil-fueled steam-electric capacity of 100 megawatts or greater. Beginning in 2001, data are for electric utility and unregulated generating plants (independent power producers, commercial plants, and industrial plants) in operating or standby status, with fossil-fueled steam-electric capacity of 100 megawatts or greater, or combustible-renewable steam electric capacity of 10 megawatts or greater.

(s)=Less than 0.5 thousand megawatts.

Note: • Components are not additive because some generators are included in more than one category.

Source: Table 11.7.

Table 11.7 Installed Nameplate Capacity of Fossil-Fuel Steam-Electric Generators With Environmental Equipment, 1985-2009 (Megawatts)

Year	Coal				Petroleum and Natural Gas				Total [1]			
	Particulate Collectors	Cooling Towers	Flue Gas Desulfurization (Scrubbers)	Total [2]	Particulate Collectors	Cooling Towers	Flue Gas Desulfurization (Scrubbers)	Total [2]	Particulate Collectors	Cooling Towers	Flue Gas Desulfurization (Scrubbers)	Total [2]
1985	302,056	120,591	56,955	304,706	36,054	28,895	65	62,371	338,110	149,486	57,020	367,078
1986	308,566	126,731	63,735	311,217	34,258	27,919	65	59,618	342,825	154,650	63,800	370,835
1987	311,043	127,875	65,688	312,885	33,431	27,912	65	58,783	344,474	155,786	65,753	371,668
1988	311,776	129,366	67,156	313,618	34,063	27,434	65	58,937	345,839	156,800	67,221	372,555
1989	313,680	131,701	67,469	315,521	33,975	28,386	65	59,736	347,655	160,087	67,534	375,257
1990	315,681	134,199	69,057	317,522	33,639	28,359	65	59,372	349,319	162,557	69,122	376,894
1991	319,046	135,565	70,474	319,110	33,864	29,067	260	59,773	352,910	164,632	70,734	378,883
1992	319,856	136,266	71,336	319,918	33,509	28,764	195	59,116	353,365	165,030	71,531	379,034
1993	318,188	135,885	71,106	318,251	32,620	28,922	–	58,580	350,808	164,807	71,106	376,831
1994	319,485	137,266	80,617	319,776	31,695	28,186	–	57,123	351,180	165,452	80,617	376,899
1995	320,685	138,108	84,677	320,749	30,513	27,187	–	54,942	351,198	165,295	84,677	375,691
1996	321,805	139,065	85,842	321,869	30,349	27,685	–	55,275	352,154	166,749	85,842	377,144
1997	320,646	138,120	86,605	320,710	31,422	28,766	–	56,485	352,068	166,886	86,605	377,195
1998	321,082	139,082	87,783	321,353	30,708	27,814	–	55,764	351,790	166,896	87,783	377,117
1999	324,109	146,377	89,666	331,379	29,371	29,142	–	55,812	353,480	175,520	89,666	387,192
2000	321,636	146,093	89,675	328,741	31,090	29,427	–	57,697	352,727	175,520	89,675	386,438
2001[3]	329,187	154,747	97,804	329,187	31,575	34,649	184	61,634	360,762	189,396	97,988	390,821
2002	329,459	154,750	98,363	329,459	29,879	45,920	310	72,008	359,338	200,670	98,673	401,341
2003	328,587	155,158	99,257	328,587	29,422	55,770	310	81,493	358,009	210,928	99,567	409,954
2004	328,506	157,968	101,182	328,506	27,402	57,082	310	81,450	355,782	214,989	101,492	409,769
2005	328,720	158,493	101,338	328,720	27,005	59,214	310	83,307	355,599	217,646	101,648	411,840
2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2007	R328,029	159,388	118,739	R328,336	R26,496	R69,497	R285	R93,066	R354,407	R228,704	R119,024	R421,120
2008	R329,099	R161,234	139,877	R329,513	R26,565	R73,315	R346	R96,984	R355,517	R234,254	R140,223	R426,073
2009	332,546	165,795	167,172	332,546	25,925	75,770	346	98,756	358,342	241,347	167,517	430,956

[1] Totals may not equal sum of components due to independent rounding.
[2] Components are not additive because some generators are included in more than one category.
[3] Through 2000, data are for electric utility plants with fossil-fueled steam-electric capacity of 100 megawatts or greater. Beginning in 2001, data are for electric utility and unregulated generating plants (independent power producers, commercial plants, and industrial plants) in operating or standby status, with fossil-fueled steam-electric capacity of 10 megawatts or greater.

R=Revised. NA=Not available. – =No data reported.

Note: See "Cooling Tower," "Flue Gas Desulfurization," and "Particulate Collectors" in Glossary.
Web Page: For related information, see http://www.eia.gov/electricity/.
Sources: • 1985-1996—U.S. Energy Information Administration (EIA), Form EIA-767, "Steam-Electric Plant Operation and Design Report." • 1997-2005—EIA, *Electric Power Annual 2008* (January 2010), Table 3.10, and Form EIA-767, "Steam-Electric Plant Operation and Design Report." • 2007 forward—EIA, *Electric Power Annual 2009* (January 2011), Table 3.10, and Form EIA-860, "Annual Electric Generator Report."

Note. Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion. Carbon dioxide (CO_2) emissions from the combustion of biomass to produce energy are excluded from the total energy-related CO_2 emissions reported in the *Annual Energy Review* Section 11, but appear separately in Tables 11.2–11.3e. According to current international convention (see the Intergovernmental Panel on Climate Change's "2006 IPCC Guidelines for National Greenhouse Gas Inventories"), carbon released through biomass combustion is excluded from reported energy-related emissions. The release of carbon from biomass combustion is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. (This is not to say that biomass energy is carbon-neutral. Energy inputs are required in order to grow, fertilize, and harvest the feedstock and to produce and process the biomass into fuels.)

However, analysts have debated whether increased use of biomass energy may result in a decline in terrestrial carbon stocks, leading to a net positive release of carbon rather than the zero net release assumed by its exclusion from reported energy-related emissions. For example, the clearing of forests for biofuel crops could result in an initial release of carbon that is not fully recaptured in subsequent use of the land for agriculture.

To reflect the potential net emissions, the international convention for greenhouse gas inventories is to report biomass emissions in the category "agriculture, forestry, and other land use," usually based on estimates of net changes in carbon stocks over time.

This indirect accounting of CO_2 emissions from biomass can potentially lead to confusion in accounting for and understanding the flow of CO_2 emissions within energy and non-energy systems. In recognition of this issue, reporting of CO_2 emissions from biomass combustion alongside other energy-related CO_2 emissions offers an alternative accounting treatment. It is important, however, to avoid misinterpreting emissions from fossil energy and biomass energy sources as necessarily additive. Instead, the combined total of direct CO_2 emissions from biomass and energy-related CO_2 emissions implicitly assumes that none of the carbon emitted was previously or subsequently reabsorbed in terrestrial sinks or that other emissions sources offset any such sequestration.