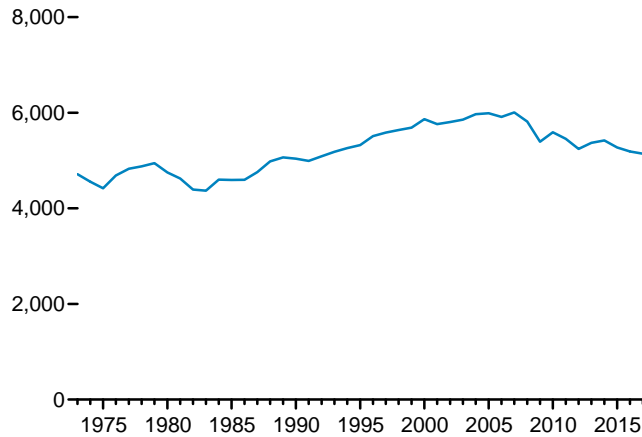


## **12. Environment**

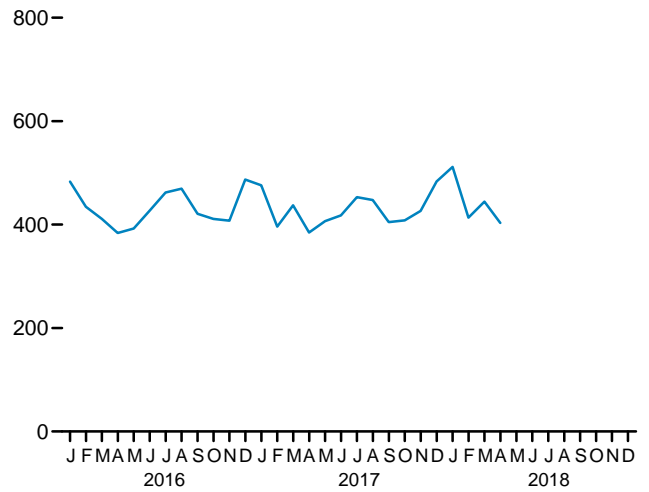
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**Figure 12.1 Carbon Dioxide Emissions From Energy Consumption by Source**  
(Million Metric Tons of Carbon Dioxide)

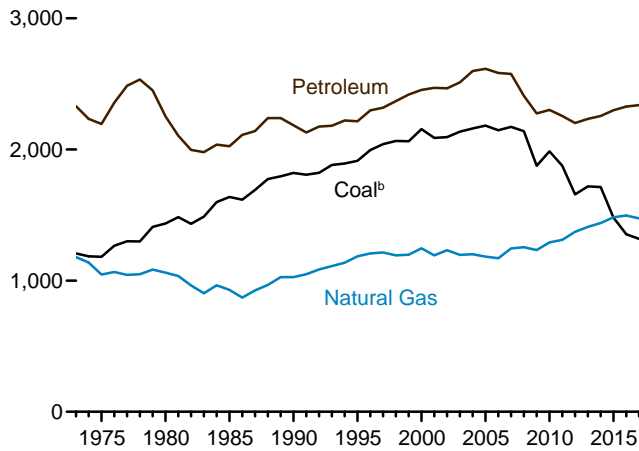
Total,<sup>a</sup> 1973–2017



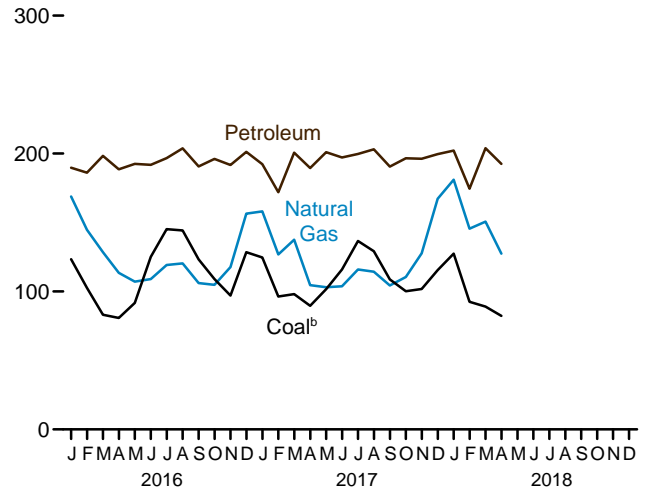
Total,<sup>a</sup> Monthly



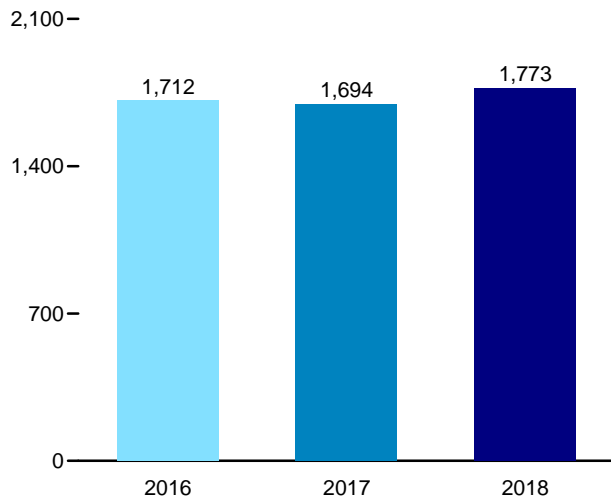
By Major Source, 1973–2017



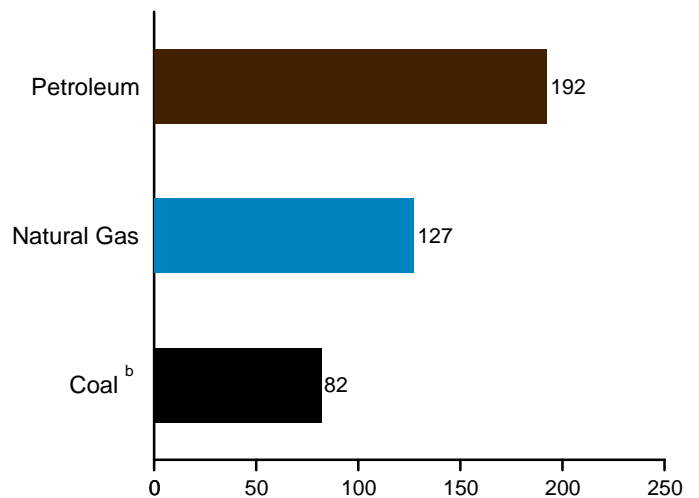
By Major Source, Monthly



Total,<sup>a</sup> January–April



By Major Source, April 2018



<sup>a</sup>Excludes emissions from biomass energy consumption.  
<sup>b</sup>Includes coal coke net imports.

Web Page: <http://www.eia.gov/totalenergy/data/monthly/#environment>.  
Source: Table 12.1.

**Table 12.1 Carbon Dioxide Emissions From Energy Consumption by Source**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

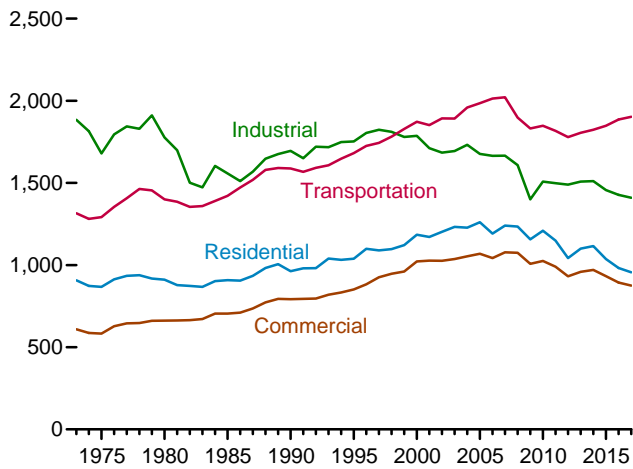
	Coal <sup>b</sup>	Natural Gas <sup>c</sup>	Petroleum										Total <sup>h,i</sup>	
			Aviation Gasoline	Distillate Fuel Oil <sup>d</sup>	HGL <sup>e</sup>	Jet Fuel	Kero-sene	Lubri-cants	Motor Gasoline <sup>f</sup>	Petroleum Coke	Residual Fuel Oil	Other <sup>g</sup>		Total
1973 Total	1,207	1,179	6	480	76	155	32	13	911	54	506	97	2,330	4,715
1975 Total	1,181	1,046	5	442	70	146	24	11	911	51	442	93	2,195	4,421
1980 Total	1,436	1,061	4	446	80	156	24	13	900	49	452	129	2,253	4,750
1985 Total	1,638	929	3	445	83	178	17	12	930	55	216	86	2,025	4,593
1990 Total	1,821	R 1,026	3	470	76	223	6	13	988	70	221	114	2,184	R 5,038
1995 Total	1,913	1,186	3	498	91	222	8	13	1,045	76	152	107	2,215	5,324
1996 Total	1,995	1,207	3	524	97	232	9	12	1,063	80	152	125	2,298	5,511
1997 Total	2,040	1,214	3	534	95	234	10	13	1,075	80	143	131	2,319	5,584
1998 Total	2,064	1,193	2	537	91	238	12	14	1,107	93	158	116	2,369	5,637
1999 Total	2,062	1,198	3	555	100	245	11	14	1,128	97	148	119	2,419	5,690
2000 Total	2,156	1,246	3	579	104	254	10	14	1,136	87	162	106	2,454	5,867
2001 Total	2,088	1,193	2	597	94	243	11	13	1,152	90	145	125	2,470	5,762
2002 Total	2,095	1,231	2	586	96	237	6	12	1,183	97	125	121	2,466	5,805
2003 Total	2,136	1,196	2	610	93	231	8	11	1,187	96	138	134	2,511	5,855
2004 Total	2,160	1,201	2	632	95	240	10	12	1,210	107	155	136	2,598	5,971
2005 Total	2,182	1,183	2	639	90	246	10	12	1,209	106	164	135	2,615	5,992
2006 Total	2,147	1,170	2	645	85	240	8	11	1,217	106	122	147	2,583	5,912
2007 Total	2,172	1,246	2	647	89	238	5	12	1,211	100	129	143	2,576	6,005
2008 Total	2,140	1,255	2	610	85	226	2	11	1,143	93	111	126	2,409	5,815
2009 Total	1,876	1,233	2	559	83	204	3	10	1,129	87	91	107	2,275	5,396
2010 Total	1,986	1,292	2	585	86	210	3	11	1,112	82	96	115	2,302	5,591
2011 Total	1,876	1,311	2	599	80	209	2	10	1,078	79	82	114	2,255	5,454
2012 Total	1,657	1,372	2	574	84	206	1	9	1,071	79	66	110	2,202	5,243
2013 Total	1,718	1,409	2	581	92	210	1	10	1,087	77	57	116	2,233	5,372
2014 Total	1,714	1,440	2	614	87	216	1	10	1,095	76	46	108	2,255	5,419
2015 Total	1,480	1,483	1	607	91	227	1	11	1,126	76	47	112	2,299	5,274
2016 January	123	169	(s)	50	9	18	(s)	1	90	7	5	10	190	483
February	103	145	(s)	48	8	18	(s)	1	90	6	3	12	186	434
March	83	128	(s)	51	8	19	(s)	1	98	7	5	9	198	411
April	81	R 114	(s)	47	6	19	(s)	1	93	5	7	10	189	384
May	92	107	(s)	48	7	20	(s)	1	98	5	5	9	192	392
June	125	109	(s)	48	6	21	(s)	1	97	4	5	10	192	427
July	145	119	(s)	46	7	21	(s)	1	100	6	6	9	197	462
August	144	120	(s)	50	6	21	(s)	1	101	8	5	11	204	469
September	123	106	(s)	49	7	20	(s)	1	96	5	4	10	191	421
October	109	105	(s)	51	7	20	(s)	1	95	6	5	11	196	411
November	97	118	(s)	49	7	20	(s)	1	93	9	4	9	192	407
December	129	156	(s)	52	9	21	(s)	1	96	7	5	10	201	487
Total	1,354	R 1,496	1	589	88	237	1	11	1,145	76	59	120	2,327	R 5,189
2017 January	125	158	(s)	49	10	20	(s)	1	88	8	7	10	192	476
February	96	127	(s)	45	7	17	(s)	1	84	4	4	9	172	396
March	98	R 138	(s)	54	8	21	(s)	1	97	3	6	11	201	437
April	90	R 105	(s)	47	7	19	(s)	1	93	6	5	11	190	R 385
May	102	103	(s)	51	7	21	(s)	1	100	6	6	10	201	407
June	116	104	(s)	49	6	21	(s)	1	98	5	6	10	197	418
July	137	116	(s)	48	7	22	(s)	1	100	9	4	10	200	453
August	129	114	(s)	51	6	22	(s)	1	102	6	5	10	203	R 448
September	109	104	(s)	49	7	20	(s)	1	94	6	5	9	191	405
October	100	110	(s)	51	7	21	(s)	1	97	3	6	10	197	408
November	102	R 128	(s)	52	8	21	(s)	1	92	7	6	9	196	R 427
December	115	167	(s)	51	9	22	(s)	1	96	7	6	9	200	483
Total	1,318	R 1,474	1	597	89	247	1	9	1,141	70	64	119	2,338	R 5,142
2018 January	R 126	181	(s)	57	11	20	1	1	90	7	5	11	202	511
February	R 92	R 146	(s)	46	8	18	(s)	1	83	3	4	11	175	413
March	R 90	R 151	(s)	54	9	21	(s)	1	98	5	3	12	204	R 445
April	82	127	(s)	52	7	20	(s)	1	93	5	6	8	192	403
4-Month Total	391	605	(s)	209	35	79	1	3	365	21	18	42	773	1,772
2017 4-Month Total	409	527	(s)	195	32	77	(s)	3	363	21	21	41	754	1,694
2016 4-Month Total	390	556	(s)	196	32	74	(s)	4	370	25	19	41	763	1,712

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.  
<sup>b</sup> Includes coal coke net imports.  
<sup>c</sup> Natural gas, excluding supplemental gaseous fuels.  
<sup>d</sup> Distillate fuel oil, excluding biodiesel.  
<sup>e</sup> Hydrocarbon gas liquids.  
<sup>f</sup> Finished motor gasoline, excluding fuel ethanol.  
<sup>g</sup> Aviation gasoline blending components, crude oil, motor gasoline blending components, petrochemical feedstocks, special naphthas, still gas, unfinished oils, waxes, and miscellaneous petroleum products.  
<sup>h</sup> Includes electric power sector use of geothermal energy and non-biomass waste. See Table 12.6.  
<sup>i</sup> Excludes emissions from biomass energy consumption. See Table 12.7.

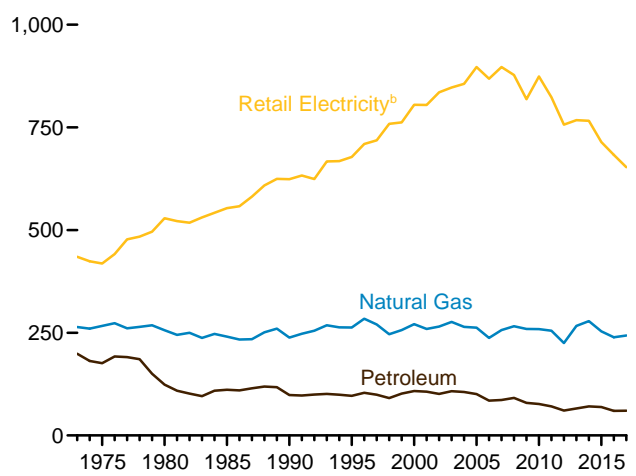
R=Revised. (s)=Less than 0.5 million metric tons.  
 Notes: • Data are estimates for carbon dioxide emissions from energy consumption, plus the relatively small amount of emissions from the non-combustion use of fossil fuels. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Data exclude emissions from biomass energy consumption. See Table 12.7 and Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.  
 Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973.  
 Sources: See end of section.

**Figure 12.2 Carbon Dioxide Emissions From Energy Consumption by Sector**  
(Million Metric Tons of Carbon Dioxide)

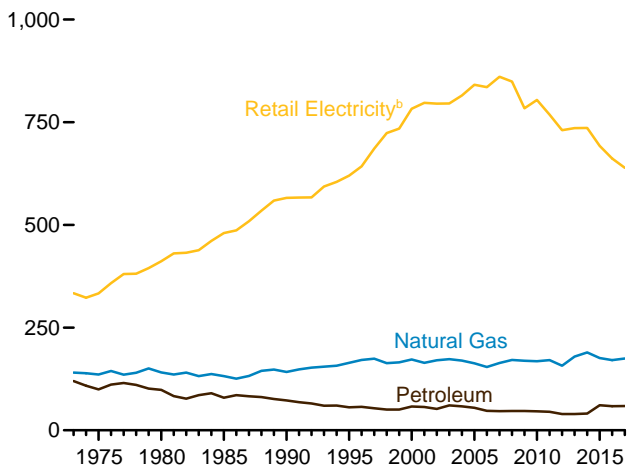
Total<sup>a</sup> by End-Use Sector,<sup>b</sup> 1973–2017



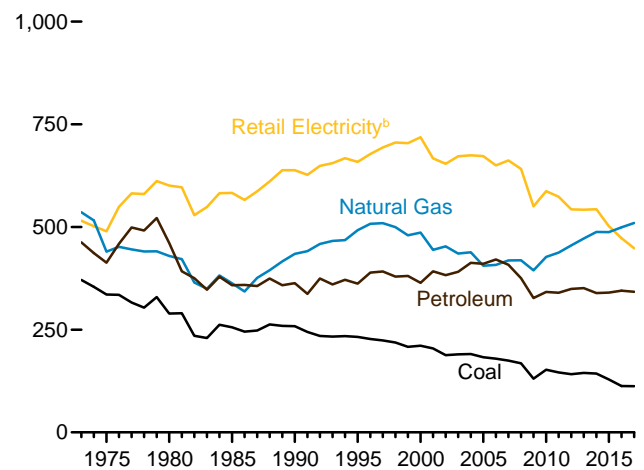
Residential Sector by Major Source, 1973–2017



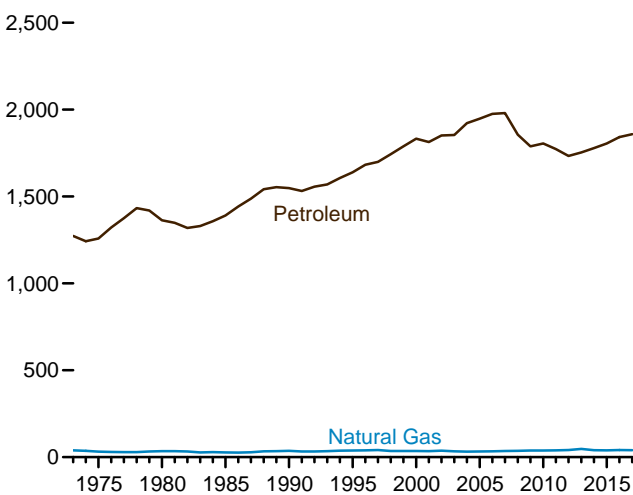
Commercial Sector by Major Source, 1973–2017



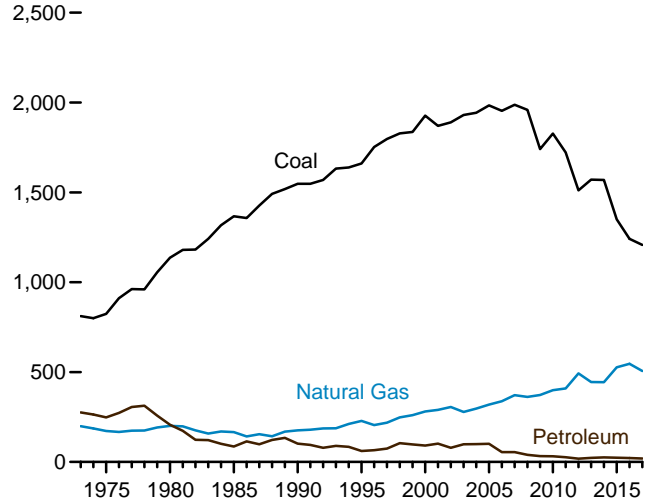
Industrial Sector by Major Source, 1973–2017



Transportation Sector by Major Source, 1973–2017



Electric Power Sector by Major Source, 1973–2017



<sup>a</sup> Excludes emissions from biomass energy consumption.

<sup>b</sup> 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.

Web Page: <http://www.eia.gov/totalenergy/data/monthly/#environment>.  
Sources: Tables 12.2–12.6.

**Table 12.2 Carbon Dioxide Emissions From Energy Consumption: Residential Sector**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

	Coal	Natural Gas <sup>b</sup>	Petroleum				Retail Electricity <sup>e</sup>	Total <sup>f</sup>
			Distillate Fuel Oil <sup>c</sup>	HGL <sup>d</sup>	Kerosene	Total		
1973 Total	9	264	147	36	16	199	435	907
1975 Total	6	266	132	32	12	176	419	867
1980 Total	3	256	96	20	8	124	529	911
1985 Total	4	241	80	20	11	111	553	909
1990 Total	3	238	72	22	5	98	624	963
1995 Total	2	263	66	25	5	96	678	1,039
1996 Total	2	284	68	30	6	104	710	1,099
1997 Total	2	270	64	29	7	99	719	1,090
1998 Total	1	247	56	27	8	91	759	1,097
1999 Total	1	257	60	33	8	102	762	1,122
2000 Total	1	271	66	35	7	108	805	1,185
2001 Total	1	259	66	33	7	106	805	1,171
2002 Total	1	265	63	34	4	101	835	1,203
2003 Total	1	276	68	34	5	108	847	1,232
2004 Total	1	264	67	32	6	106	856	1,227
2005 Total	1	262	62	32	6	101	897	1,261
2006 Total	1	237	52	28	5	85	869	1,191
2007 Total	1	257	53	31	3	86	897	1,241
2008 Total	NA	266	55	35	2	91	877	1,234
2009 Total	NA	259	43	35	2	79	819	1,157
2010 Total	NA	259	41	33	2	77	874	1,210
2011 Total	NA	255	38	31	1	71	823	1,149
2012 Total	NA	225	35	25	1	61	757	1,043
2013 Total	NA	267	36	29	1	66	768	1,100
2014 Total	NA	278	39	31	1	71	766	1,115
2015 Total	NA	253	40	28	1	69	714	1,037
2016 January	NA	48	4	3	(s)	7	65	120
February	NA	38	4	2	(s)	6	52	96
March	NA	25	3	2	(s)	5	41	71
April	NA	18	2	2	(s)	5	37	60
May	NA	11	2	2	(s)	4	43	58
June	NA	7	2	2	(s)	4	65	75
July	NA	6	2	2	(s)	4	84	93
August	NA	6	1	2	(s)	3	83	91
September	NA	6	2	2	(s)	4	64	74
October	NA	10	3	2	(s)	5	49	64
November	NA	21	3	2	(s)	5	43	69
December	NA	44	5	2	(s)	7	62	113
Total	NA	239	32	27	1	60	683	R 982
2017 January	NA	46	4	3	(s)	7	63	116
February	NA	32	3	2	(s)	6	44	82
March	NA	32	3	2	(s)	5	46	83
April	NA	15	2	2	(s)	5	39	R 60
May	NA	11	2	2	(s)	4	46	61
June	NA	7	2	2	(s)	4	59	70
July	NA	6	1	2	(s)	4	77	87
August	NA	6	2	2	(s)	4	71	81
September	NA	6	2	2	(s)	4	56	66
October	NA	11	2	2	(s)	4	47	63
November	NA	26	3	2	(s)	6	46	77
December	NA	45	5	3	(s)	7	60	R 113
Total	NA	243	32	27	1	60	653	956
2018 January	NA	R 54	6	3	(s)	9	73	136
February	NA	38	4	3	(s)	6	48	92
March	NA	36	3	3	(s)	6	45	87
April	NA	24	3	2	(s)	5	40	69
4-Month Total	NA	152	15	11	(s)	26	206	384
2017 4-Month Total	NA	125	13	9	(s)	23	193	341
2016 4-Month Total	NA	129	13	10	(s)	23	195	347

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

<sup>b</sup> Natural gas, excluding supplemental gaseous fuels.

<sup>c</sup> Distillate fuel oil, excluding biodiesel.

<sup>d</sup> Hydrocarbon gas liquids.

<sup>e</sup> 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 7.6 and 12.6.

<sup>f</sup> Excludes emissions from biomass energy consumption. See Table 12.7.

R=Revised. NA=Not available. (s)=Less than 0.5 million metric tons.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Data exclude emissions from biomass energy consumption. See Table 12.7 and Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973.

Sources: See end of section.

**Table 12.3 Carbon Dioxide Emissions From Energy Consumption: Commercial Sector**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

	Coal	Natural Gas <sup>b</sup>	Petroleum							Retail Electricity <sup>f</sup>	Total <sup>g</sup>
			Distillate Fuel Oil <sup>c</sup>	HGL <sup>d</sup>	Kerosene	Motor Gasoline <sup>e</sup>	Petroleum Coke	Residual Fuel Oil	Total		
1973 Total	15	141	47	9	5	6	NA	52	120	334	609
1975 Total	14	136	43	8	4	6	NA	39	100	333	583
1980 Total	11	141	38	6	3	8	NA	44	98	412	662
1985 Total	13	132	46	6	2	7	NA	18	79	480	704
1990 Total	12	142	39	6	1	8	0	18	73	566	793
1995 Total	11	164	35	7	2	1	(s)	11	56	620	851
1996 Total	12	171	35	8	2	2	(s)	11	57	643	883
1997 Total	12	174	32	8	2	3	(s)	9	54	686	926
1998 Total	9	164	31	7	2	3	(s)	7	50	724	947
1999 Total	10	165	32	9	2	2	(s)	6	51	735	960
2000 Total	9	173	36	9	2	3	(s)	7	58	783	1,022
2001 Total	9	164	37	9	2	3	(s)	6	57	797	1,027
2002 Total	9	170	32	9	1	3	(s)	6	52	795	1,026
2003 Total	8	173	36	10	1	4	(s)	9	60	796	1,037
2004 Total	10	170	34	10	1	3	(s)	10	58	815	1,053
2005 Total	9	163	33	8	2	3	(s)	9	55	841	1,069
2006 Total	6	154	29	8	1	3	(s)	6	47	835	1,043
2007 Total	7	164	28	8	1	4	(s)	6	46	861	1,078
2008 Total	8	171	28	10	(s)	3	(s)	6	47	849	1,075
2009 Total	7	169	29	9	(s)	4	(s)	6	47	784	1,007
2010 Total	7	168	29	9	(s)	3	(s)	5	46	804	1,025
2011 Total	6	171	29	9	(s)	3	(s)	4	45	768	990
2012 Total	4	157	26	9	(s)	3	(s)	2	40	731	932
2013 Total	4	179	25	10	(s)	3	(s)	2	39	736	958
2014 Total	4	190	26	10	(s)	4	(s)	1	41	736	970
2015 Total	3	176	26	9	(s)	25	(s)	(s)	61	692	932
2016 January	(s)	28	3	1	(s)	2	(s)	(s)	6	55	89
February	(s)	23	3	1	(s)	2	(s)	(s)	6	46	75
March	(s)	16	2	1	(s)	2	(s)	(s)	5	43	65
April	(s)	13	2	1	(s)	2	(s)	(s)	5	43	61
May	(s)	9	2	1	(s)	2	0	(s)	5	49	63
June	(s)	8	1	1	(s)	2	(s)	(s)	4	63	74
July	(s)	7	1	1	(s)	2	(s)	(s)	4	70	82
August	(s)	8	1	1	(s)	2	0	(s)	4	71	83
September	(s)	8	1	1	(s)	2	0	(s)	4	61	73
October	(s)	R 11	2	1	(s)	2	0	(s)	5	54	70
November	(s)	15	2	1	(s)	2	(s)	(s)	5	48	69
December	(s)	25	4	1	(s)	2	(s)	(s)	7	56	88
Total	2	R 171	24	9	(s)	25	(s)	(s)	59	662	R 894
2017 January	(s)	26	3	1	(s)	2	(s)	(s)	6	53	86
February	(s)	20	2	1	(s)	2	(s)	(s)	5	44	69
March	(s)	R 21	2	1	(s)	2	(s)	(s)	5	48	74
April	(s)	12	2	1	(s)	2	(s)	(s)	5	44	61
May	(s)	10	1	1	(s)	2	(s)	(s)	4	51	65
June	(s)	8	2	1	(s)	2	(s)	(s)	5	58	70
July	(s)	7	1	1	(s)	2	(s)	(s)	4	67	78
August	(s)	8	1	1	(s)	2	(s)	(s)	4	64	76
September	(s)	8	1	1	(s)	2	(s)	(s)	4	56	68
October	(s)	11	2	1	(s)	2	(s)	(s)	5	52	68
November	(s)	18	3	1	(s)	2	(s)	(s)	5	49	73
December	(s)	27	3	1	(s)	2	(s)	(s)	7	53	87
Total	2	R 175	24	10	(s)	25	(s)	(s)	59	639	R 875
2018 January	(s)	30	4	1	(s)	2	(s)	(s)	7	56	94
February	(s)	23	3	1	(s)	2	(s)	(s)	5	43	72
March	(s)	23	2	1	(s)	2	(s)	(s)	5	46	74
April	(s)	16	2	1	(s)	2	(s)	(s)	5	43	65
4-Month Total	1	92	11	4	(s)	8	(s)	(s)	23	188	305
2017 4-Month Total	1	79	10	3	(s)	8	(s)	(s)	21	189	289
2016 4-Month Total	1	80	10	3	(s)	8	(s)	(s)	21	187	289

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

<sup>b</sup> Natural gas, excluding supplemental gaseous fuels.

<sup>c</sup> Distillate fuel oil, excluding biodiesel.

<sup>d</sup> Hydrocarbon gas liquids.

<sup>e</sup> Finished motor gasoline, excluding fuel ethanol.

<sup>f</sup> 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 7.6 and 12.6.

<sup>g</sup> Excludes emissions from biomass energy consumption. See Table 12.7.

R=Revised. NA=Not available. (s)=Less than 0.5 million metric tons.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Data exclude emissions from biomass energy consumption. See Table 12.7 and Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973.

Sources: See end of section.

**Table 12.4 Carbon Dioxide Emissions From Energy Consumption: Industrial Sector**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

	Coal	Coal Coke Net Imports	Natural Gas <sup>b</sup>	Petroleum								Retail Elec- tricity <sup>g</sup>	Total <sup>h</sup>	
				Distillate Fuel Oil <sup>c</sup>	HGL <sup>d</sup>	Kero- sene	Lubri- cants	Motor Gasoline <sup>e</sup>	Petroleum Coke	Residual Fuel Oil	Other <sup>f</sup>			Total
1973 Total	371	-1	536	106	28	11	7	18	53	142	97	463	515	1,884
1975 Total	336	2	440	97	27	9	6	16	51	115	93	413	490	1,680
1980 Total	289	-4	430	96	54	13	7	11	49	103	129	461	601	1,776
1985 Total	256	-2	363	81	55	3	6	15	54	57	86	358	583	1,558
1990 Total	258	1	435	84	46	1	7	13	67	32	114	363	638	1,695
1995 Total	233	7	492	82	58	1	7	14	68	25	107	362	659	1,752
1996 Total	227	3	508	86	59	1	6	14	72	25	125	389	678	1,804
1997 Total	224	5	509	88	58	1	7	15	70	22	131	392	694	1,824
1998 Total	219	8	500	88	56	2	7	14	80	16	116	379	706	1,811
1999 Total	208	7	480	86	57	1	7	11	85	14	119	381	704	1,780
2000 Total	211	7	486	87	58	1	7	11	77	17	106	364	719	1,787
2001 Total	204	3	444	94	51	2	6	21	79	14	125	392	667	1,712
2002 Total	188	7	453	88	52	1	6	22	79	13	121	383	654	1,684
2003 Total	190	6	435	85	48	2	6	23	78	15	134	391	672	1,694
2004 Total	190	16	438	88	52	2	6	26	85	17	136	413	674	1,732
2005 Total	183	5	406	92	48	3	6	25	82	20	135	410	672	1,677
2006 Total	179	7	408	91	47	2	6	26	85	16	147	421	650	1,664
2007 Total	175	3	418	91	50	1	6	21	83	13	143	408	662	1,666
2008 Total	168	5	419	98	38	(s)	6	17	78	13	126	375	642	1,608
2009 Total	131	-3	395	78	38	(s)	5	16	73	9	107	327	550	1,400
2010 Total	153	-1	427	84	43	1	5	17	68	8	115	342	587	1,508
2011 Total	146	1	438	90	39	(s)	5	17	65	9	114	340	574	1,498
2012 Total	141	(s)	455	93	50	(s)	4	17	70	5	110	349	543	1,489
2013 Total	145	-2	472	92	53	(s)	5	17	65	3	116	351	542	1,508
2014 Total	143	-2	488	100	45	(s)	5	14	64	3	108	339	543	1,511
2015 Total	129	-2	487	85	53	(s)	5	17	65	2	112	340	502	1,456
2016 January	10	(s)	46	8	6	(s)	(s)	1	6	(s)	10	32	39	126
February	10	(s)	42	8	5	(s)	(s)	1	5	(s)	12	33	34	119
March	10	(s)	43	9	4	(s)	(s)	1	6	(s)	9	30	32	115
April	9	(s)	40	6	4	(s)	(s)	1	4	(s)	10	27	33	109
May	9	(s)	40	6	4	(s)	(s)	1	4	(s)	9	25	37	111
June	9	(s)	39	6	3	(s)	(s)	1	3	(s)	10	25	44	117
July	9	(s)	40	4	4	(s)	(s)	2	5	(s)	9	24	47	121
August	9	(s)	41	7	4	(s)	(s)	2	7	(s)	11	31	47	128
September	9	(s)	39	7	4	(s)	(s)	1	4	(s)	10	27	41	117
October	9	(s)	40	7	4	(s)	(s)	1	5	(s)	11	30	39	118
November	9	-1	42	8	4	(s)	(s)	1	8	(s)	9	30	36	117
December	10	(s)	46	7	5	(s)	(s)	1	6	(s)	10	31	40	127
Total	113	-2	R 499	84	51	(s)	5	17	64	4	120	345	473	R 1,428
2017 January	9	(s)	46	7	6	(s)	(s)	1	7	(s)	10	32	37	124
February	9	(s)	41	7	4	(s)	(s)	1	4	(s)	9	26	32	107
March	9	(s)	44	10	5	(s)	(s)	1	3	(s)	11	30	34	118
April	9	(s)	40	6	4	(s)	(s)	1	5	(s)	11	29	33	111
May	9	(s)	41	8	4	(s)	(s)	2	5	(s)	10	29	37	116
June	9	(s)	40	6	3	(s)	(s)	1	4	(s)	10	26	40	114
July	10	(s)	41	5	4	(s)	(s)	2	8	(s)	10	29	44	123
August	10	(s)	41	7	3	(s)	(s)	2	5	(s)	10	28	43	121
September	9	(s)	40	7	4	(s)	(s)	1	6	(s)	9	28	38	115
October	9	(s)	42	7	4	(s)	(s)	1	3	(s)	10	27	37	R 115
November	9	(s)	44	9	5	(s)	(s)	1	6	(s)	9	31	36	120
December	10	(s)	R 49	6	5	(s)	(s)	1	6	(s)	9	28	38	R 124
Total	112	-3	R 510	86	51	(s)	4	17	61	4	119	342	448	R 1,409
2018 January	R 9	(s)	49	10	6	(s)	(s)	1	6	(s)	11	35	37	R 130
February	9	(s)	44	7	5	(s)	(s)	1	3	(s)	11	28	31	111
March	R 9	(s)	47	10	5	(s)	(s)	1	5	(s)	12	33	33	R 122
April	9	(s)	45	8	4	(s)	(s)	1	5	(s)	8	28	32	112
4-Month Total	36	-1	185	35	20	(s)	1	6	18	1	42	124	132	475
2017 4-Month Total	37	-1	172	30	19	(s)	1	6	18	1	41	116	136	460
2016 4-Month Total	38	(s)	171	32	19	(s)	2	6	21	1	41	121	139	470

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

<sup>b</sup> Natural gas, excluding supplemental gaseous fuels.

<sup>c</sup> Distillate fuel oil, excluding biodiesel.

<sup>d</sup> Hydrocarbon gas liquids.

<sup>e</sup> Finished motor gasoline, excluding fuel ethanol.

<sup>f</sup> Aviation gasoline blending components, crude oil, motor gasoline blending components, petrochemical feedstocks, special naphthas, still gas, unfinished oils, waxes, and miscellaneous petroleum products.

<sup>g</sup> 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 7.6 and 12.6.

<sup>h</sup> Excludes emissions from biomass energy consumption. See Table 12.7.

R=Revised. (s)=Less than 0.5 million metric tons and greater than -0.5 million metric tons.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption, plus the relatively small amount of emissions from the non-combustion use of fossil fuels. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Data exclude emissions from biomass energy consumption. See Table 12.7 and Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973.

Sources: See end of section.

**Table 12.5 Carbon Dioxide Emissions From Energy Consumption: Transportation Sector**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

	Coal	Natural Gas <sup>b</sup>	Petroleum							Retail Electricity <sup>f</sup>	Total <sup>g</sup>	
			Aviation Gasoline	Distillate Fuel Oil <sup>c</sup>	HGL <sup>d</sup>	Jet Fuel	Lubricants	Motor Gasoline <sup>e</sup>	Residual Fuel Oil			Total
1973 Total	(s)	39	6	163	3	152	6	886	57	1,273	2	1,315
1975 Total	(s)	32	5	155	3	145	6	889	56	1,258	2	1,292
1980 Total	(h)	34	4	204	1	155	6	881	110	1,363	2	1,400
1985 Total	(h)	28	3	232	2	178	6	908	62	1,391	3	1,421
1990 Total	(h)	36	3	268	1	223	7	967	80	1,548	3	1,588
1995 Total	(h)	38	3	307	1	222	6	1,029	72	1,640	3	1,681
1996 Total	(h)	39	3	327	1	232	6	1,047	67	1,683	3	1,725
1997 Total	(h)	41	3	341	1	234	6	1,057	56	1,700	3	1,744
1998 Total	(h)	35	2	352	1	238	7	1,090	53	1,743	3	1,782
1999 Total	(h)	36	3	365	1	245	7	1,115	52	1,789	3	1,828
2000 Total	(h)	36	3	377	1	254	7	1,122	70	1,833	4	1,873
2001 Total	(h)	35	2	387	1	243	6	1,128	46	1,813	4	1,852
2002 Total	(h)	37	2	394	1	237	6	1,158	53	1,852	4	1,892
2003 Total	(h)	33	2	408	1	231	6	1,161	45	1,854	5	1,892
2004 Total	(h)	32	2	433	1	240	6	1,181	58	1,922	5	1,959
2005 Total	(h)	33	2	444	2	246	6	1,182	66	1,948	5	1,986
2006 Total	(h)	33	2	467	2	240	5	1,188	71	1,976	5	2,014
2007 Total	(h)	35	2	469	1	238	5	1,186	78	1,980	5	2,021
2008 Total	(h)	37	2	424	3	226	5	1,124	73	1,856	5	1,898
2009 Total	(h)	38	2	405	2	204	5	1,109	62	1,789	5	1,832
2010 Total	(h)	38	2	426	1	210	6	1,091	70	1,805	5	1,848
2011 Total	(h)	39	2	437	1	209	6	1,058	61	1,773	4	1,817
2012 Total	(h)	41	2	416	1	206	5	1,051	53	1,734	4	1,779
2013 Total	(h)	47	2	424	1	210	5	1,066	46	1,754	4	1,805
2014 Total	(h)	40	2	443	1	216	6	1,077	35	1,779	4	1,823
2015 Total	(h)	40	1	449	1	227	6	1,084	37	1,805	4	1,848
2016 January	(h)	5	(s)	34	(s)	18	1	87	4	143	(s)	148
February	(h)	4	(s)	33	(s)	18	1	86	2	140	(s)	144
March	(h)	3	(s)	37	(s)	19	1	94	5	156	(s)	160
April	(h)	3	(s)	36	(s)	19	(s)	89	6	151	(s)	154
May	(h)	3	(s)	38	(s)	20	(s)	94	4	157	(s)	160
June	(h)	3	(s)	39	(s)	21	1	93	4	157	(s)	161
July	(h)	3	(s)	39	(s)	21	(s)	96	5	162	(s)	166
August	(h)	3	(s)	41	(s)	21	(s)	97	4	164	(s)	167
September	(h)	3	(s)	38	(s)	20	(s)	92	3	153	(s)	156
October	(h)	3	(s)	39	(s)	20	(s)	91	4	155	(s)	158
November	(h)	3	(s)	36	(s)	20	(s)	89	4	150	(s)	153
December	(h)	4	(s)	36	(s)	21	(s)	93	4	154	(s)	159
Total	(h)	41	1	445	1	237	6	1,103	49	1,842	4	1,886
2017 January	(h)	4	(s)	33	(s)	20	(s)	85	6	145	(s)	150
February	(h)	3	(s)	32	(s)	17	(s)	81	3	134	(s)	138
March	(h)	4	(s)	38	(s)	21	(s)	94	5	158	(s)	162
April	(h)	3	(s)	37	(s)	19	(s)	90	4	150	(s)	153
May	(h)	3	(s)	40	(s)	21	(s)	96	5	162	(s)	165
June	(h)	3	(s)	39	(s)	21	(s)	95	5	161	(s)	164
July	(h)	3	(s)	40	(s)	22	(s)	96	3	161	(s)	165
August	(h)	3	(s)	41	(s)	22	(s)	98	4	166	(s)	169
September	(h)	3	(s)	38	(s)	20	(s)	90	4	153	(s)	156
October	(h)	3	(s)	39	(s)	21	(s)	93	5	160	(s)	163
November	(h)	3	(s)	37	(s)	21	(s)	88	6	152	(s)	156
December	(h)	4	(s)	36	(s)	22	(s)	92	5	155	(s)	160
Total	(h)	40	1	451	1	247	5	1,099	55	1,858	4	1,902
2018 January	(h)	5	(s)	35	(s)	20	(s)	87	3	146	(s)	151
February	(h)	4	(s)	32	(s)	18	(s)	80	3	134	(s)	138
March	(h)	4	(s)	38	(s)	21	(s)	95	3	158	(s)	162
April	(h)	3	(s)	38	(s)	20	(s)	89	5	153	(s)	157
4-Month Total	(h)	16	(s)	144	(s)	79	2	351	15	591	1	608
2017 4-Month Total	(h)	14	(s)	140	(s)	77	2	350	18	588	1	603
2016 4-Month Total	(h)	15	(s)	140	(s)	74	2	357	16	590	1	606

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

<sup>b</sup> Natural gas, excluding supplemental gaseous fuels.

<sup>c</sup> Distillate fuel oil, excluding biodiesel.

<sup>d</sup> Hydrocarbon gas liquids.

<sup>e</sup> Finished motor gasoline, excluding fuel ethanol.

<sup>f</sup> 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 7.6 and 12.6.

<sup>g</sup> Excludes emissions from biomass energy consumption. See Table 12.7.

<sup>h</sup> Beginning in 1978, the small amounts of coal consumed for transportation are reported as industrial sector consumption.

(s)=Less than 0.5 million metric tons.

Notes: • Data are estimates for carbon dioxide emissions from energy consumption, plus the relatively small amount of emissions from the non-combustion use of fossil fuels. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Data exclude emissions from biomass energy consumption. See Table 12.7 and Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973. Sources: See end of section.



**Table 12.6 Carbon Dioxide Emissions From Energy Consumption: Electric Power Sector**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

	Coal	Natural Gas <sup>b</sup>	Petroleum				Geo-thermal	Non-Biomass Waste <sup>d</sup>	Total <sup>e</sup>
			Distillate Fuel Oil <sup>c</sup>	Petroleum Coke	Residual Fuel Oil	Total			
1973 Total	812	199	20	2	254	276	NA	NA	1,286
1975 Total	824	172	17	(s)	231	248	NA	NA	1,244
1980 Total	1,137	200	12	1	194	207	NA	NA	1,544
1985 Total	1,367	166	6	1	79	86	NA	NA	1,619
1990 Total	1,548	176	7	3	92	102	(s)	6	1,831
1995 Total	1,661	228	8	8	45	61	(s)	10	1,960
1996 Total	1,752	205	8	8	50	66	(s)	10	2,033
1997 Total	1,797	219	8	10	56	75	(s)	10	2,101
1998 Total	1,828	248	10	13	82	105	(s)	10	2,192
1999 Total	1,836	260	10	11	76	97	(s)	10	2,204
2000 Total	1,927	281	13	10	69	91	(s)	10	2,310
2001 Total	1,870	290	12	11	79	102	(s)	11	2,273
2002 Total	1,890	306	9	18	52	79	(s)	13	2,288
2003 Total	1,931	278	12	18	69	98	(s)	11	2,319
2004 Total	1,943	297	8	22	69	99	(s)	11	2,350
2005 Total	1,984	319	8	24	69	101	(s)	11	2,416
2006 Total	1,954	338	5	21	28	55	(s)	12	2,358
2007 Total	1,987	372	6	17	31	54	(s)	11	2,425
2008 Total	1,959	362	5	15	19	39	(s)	12	2,373
2009 Total	1,741	373	5	13	14	33	(s)	11	2,158
2010 Total	1,828	399	6	14	12	32	(s)	11	2,270
2011 Total	1,723	409	5	14	7	26	(s)	11	2,170
2012 Total	1,511	493	4	9	6	19	(s)	11	2,034
2013 Total	1,571	444	4	13	6	23	(s)	11	2,050
2014 Total	1,569	444	6	12	7	26	(s)	11	2,050
2015 Total	1,350	527	5	11	7	24	(s)	11	1,913
2016 January	114	42	1	1	1	2	(s)	1	159
February	93	38	(s)	1	1	2	(s)	1	133
March	73	41	(s)	1	(s)	2	(s)	1	117
April	72	39	(s)	1	(s)	2	(s)	1	114
May	82	44	(s)	1	(s)	2	(s)	1	129
June	116	53	(s)	1	(s)	2	(s)	1	172
July	136	62	(s)	1	1	2	(s)	1	201
August	135	63	(s)	1	1	2	(s)	1	201
September	114	50	(s)	1	(s)	2	(s)	1	167
October	100	41	(s)	1	(s)	1	(s)	1	143
November	88	36	(s)	1	(s)	2	(s)	1	127
December	119	37	(s)	1	(s)	2	(s)	1	158
Total	1,241	547	4	12	6	22	(s)	11	1,821
2017 January	115	35	(s)	1	(s)	2	(s)	1	154
February	87	31	(s)	1	(s)	1	(s)	1	120
March	89	37	(s)	1	(s)	1	(s)	1	128
April	81	34	(s)	(s)	(s)	1	(s)	1	117
May	92	39	(s)	1	(s)	2	(s)	1	134
June	107	47	(s)	1	(s)	2	(s)	1	156
July	127	59	(s)	1	(s)	2	(s)	1	188
August	120	57	(s)	1	(s)	2	(s)	1	179
September	99	47	(s)	1	(s)	1	(s)	1	149
October	91	43	(s)	1	(s)	1	(s)	1	136
November	93	36	(s)	1	(s)	1	(s)	1	131
December	106	42	1	1	1	2	(s)	1	151
Total	1,207	506	4	10	5	19	(s)	11	1,744
2018 January	117	43	2	1	2	5	(s)	1	167
February	83	37	(s)	1	(s)	1	(s)	1	122
March	81	41	(s)	1	(s)	1	(s)	1	124
April	74	39	(s)	1	(s)	1	(s)	1	115
4-Month Total	355	159	3	3	3	9	(s)	4	527
2017 4-Month Total	372	137	1	3	2	6	(s)	4	519
2016 4-Month Total	351	160	1	4	2	7	(s)	4	522

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

<sup>b</sup> Natural gas, excluding supplemental gaseous fuels.

<sup>c</sup> Distillate fuel oil, excluding biodiesel.

<sup>d</sup> Municipal solid waste from non-biogenic sources, and tire-derived fuels. Through 1994, also includes blast furnace gas, and other manufactured and waste gases derived from fossil fuels.

<sup>e</sup> Excludes emissions from biomass energy consumption. See Table 12.7.

NA=Not available. (s)=Less than 0.5 million metric tons.

Notes: • Data are estimates for carbon dioxide emissions from energy

consumption. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Data exclude emissions from biomass energy consumption. See Table 12.7 and Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973.

Sources: See end of section.

**Table 12.7 Carbon Dioxide Emissions From Biomass Energy Consumption**  
(Million Metric Tons of Carbon Dioxide<sup>a</sup>)

	By Source					By Sector					
	Wood <sup>b</sup>	Biomass Waste <sup>c</sup>	Fuel Ethanol <sup>d</sup>	Bio-diesel	Total	Residential	Commercial <sup>e</sup>	Industrial <sup>f</sup>	Transportation	Electric Power <sup>g</sup>	Total
1973 Total	143	(s)	NA	NA	143	33	1	109	NA	(s)	143
1975 Total	140	(s)	NA	NA	141	40	1	100	NA	(s)	141
1980 Total	232	(s)	NA	NA	232	80	2	150	NA	(s)	232
1985 Total	252	14	3	NA	270	95	2	168	3	1	270
1990 Total	208	24	4	NA	237	54	8	147	4	23	237
1995 Total	222	30	8	NA	260	49	9	166	8	28	260
1996 Total	229	32	6	NA	266	51	10	170	6	30	266
1997 Total	222	30	7	NA	259	40	10	172	7	30	259
1998 Total	205	30	8	NA	242	36	9	160	8	30	242
1999 Total	208	29	8	NA	245	37	9	161	8	30	245
2000 Total	212	27	9	NA	248	39	9	161	9	29	248
2001 Total	188	33	10	(s)	231	35	9	147	10	31	231
2002 Total	187	36	12	(s)	235	36	9	144	12	35	235
2003 Total	188	36	16	(s)	240	38	9	141	16	37	240
2004 Total	199	35	20	(s)	255	38	10	151	20	36	255
2005 Total	200	37	23	1	261	40	10	150	23	37	261
2006 Total	197	36	31	2	266	36	9	151	33	38	266
2007 Total	196	37	39	3	276	39	9	146	41	39	276
2008 Total	193	39	55	3	290	44	10	139	57	40	290
2009 Total	181	41	62	3	287	47	10	125	64	41	287
2010 Total	199	42	73	2	316	41	10	149	74	42	316
2011 Total	201	42	73	8	324	42	11	151	80	40	324
2012 Total	200	42	73	8	324	39	10	153	80	42	324
2013 Total	220	45	75	13	353	54	11	158	87	43	353
2014 Total	226	47	76	13	362	55	12	158	88	49	362
2015 Total	210	47	79	14	350	41	13	157	90	48	350
2016 January	17	4	6	1	28	3	1	13	7	4	28
February	16	4	6	1	27	3	1	13	7	4	27
March	17	4	7	1	29	3	1	13	8	4	29
April	16	4	6	1	27	3	1	12	7	4	27
May	16	4	7	2	29	3	1	13	8	4	29
June	16	4	7	2	29	3	1	13	8	4	29
July	17	4	7	2	30	3	1	13	9	4	30
August	17	4	7	2	30	3	1	13	9	4	30
September	16	4	7	2	28	3	1	12	8	4	28
October	16	4	7	2	28	3	1	13	8	3	28
November	16	4	7	2	29	3	1	13	8	4	29
December	19	4	7	2	32	3	1	15	9	4	32
<b>Total</b>	<b>200</b>	<b>46</b>	<b>81</b>	<b>20</b>	<b>346</b>	<b>33</b>	<b>14</b>	<b>155</b>	<b>98</b>	<b>47</b>	<b>346</b>
2017 January	17	4	6	1	29	3	1	13	7	4	29
February	16	4	6	1	26	2	1	12	7	4	26
March	17	4	7	1	29	3	1	13	8	4	29
April	16	4	7	2	28	3	1	13	8	4	28
May	16	4	7	2	29	3	1	13	9	4	29
June	17	3	7	2	29	3	1	13	9	4	29
July	17	4	7	2	30	3	1	13	9	4	30
August	18	4	7	2	30	3	1	13	9	4	30
September	16	3	7	2	28	3	1	12	8	4	28
October	17	4	7	2	29	3	1	13	8	4	29
November	17	4	7	2	29	3	1	13	8	4	29
December	18	4	7	1	30	3	1	14	8	4	30
<b>Total</b>	<b>201</b>	<b>44</b>	<b>82</b>	<b>18</b>	<b>345</b>	<b>31</b>	<b>14</b>	<b>155</b>	<b>97</b>	<b>48</b>	<b>345</b>
2018 January	18	4	7	1	30	3	1	13	8	4	30
February	16	4	6	1	27	3	1	12	7	4	27
March	17	4	7	1	29	3	1	13	8	4	29
April	17	4	6	1	28	3	1	13	7	4	28
<b>4-Month Total</b>	<b>68</b>	<b>15</b>	<b>26</b>	<b>5</b>	<b>114</b>	<b>12</b>	<b>5</b>	<b>52</b>	<b>30</b>	<b>16</b>	<b>114</b>
2017 4-Month Total	66	15	26	5	112	10	5	52	30	16	112
2016 4-Month Total	66	15	26	5	112	11	5	51	30	16	112

<sup>a</sup> Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.

<sup>b</sup> Wood and wood-derived fuels.

<sup>c</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

<sup>d</sup> Fuel ethanol minus denaturant.

<sup>e</sup> Commercial sector, including commercial combined-heat-and-power (CHP) and commercial electricity-only plants.

<sup>f</sup> Industrial sector, including industrial combined-heat-and-power (CHP) and industrial electricity-only plants.

<sup>g</sup> 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.

NA=Not available. (s)=Less than 0.5 million metric tons.

Notes: • Carbon dioxide emissions from biomass energy consumption are excluded from the energy-related carbon dioxide emissions reported in Tables 12.1–12.6. See Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Data are estimates. See "Section 12 Methodology and Sources" at end of section. • See "Carbon Dioxide" in Glossary. • See Note 1, "Emissions of Carbon Dioxide and Other Greenhouse Gases," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#environment> (Excel and CSV files) for all available annual and monthly data beginning in 1973.

Sources: See end of section.

## Environment

**Note 1. Emissions of Carbon Dioxide and Other Greenhouse Gases.** Greenhouse gases are those gases—such as water vapor, carbon dioxide (CO<sub>2</sub>), methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride—that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.

Energy-related carbon dioxide emissions account for about 98% of U.S. CO<sub>2</sub> emissions. The vast majority of CO<sub>2</sub> emissions come from fossil fuel combustion, with smaller amounts from the non-combustion use of fossil fuels, as well as from electricity generation using geothermal energy and non-biomass waste. Other sources of CO<sub>2</sub> emissions include industrial processes, such as cement and limestone production. Data in the U.S. Energy Information Administration's (EIA) *Monthly Energy Review (MER)* Tables 12.1–12.6 are estimates for U.S. CO<sub>2</sub> emissions from energy consumption, plus the non-combustion use of fossil fuels (excluded are estimates for CO<sub>2</sub> emissions from biomass energy consumption, which appear in MER Table 12.7).

For annual U.S. estimates for emissions of CO<sub>2</sub> from all sources, as well as for emissions of other greenhouse gases, see EIA's *Emissions of Greenhouse Gases Report* at [http://www.eia.gov/environment/emissions/ghg\\_report/](http://www.eia.gov/environment/emissions/ghg_report/).

**Note 2. Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion.** Carbon dioxide (CO<sub>2</sub>) emissions from the combustion of biomass to produce energy are excluded from the energy-related CO<sub>2</sub> emissions reported in MER Tables 12.1–12.6, but appear in MER Table 12.7. 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<sub>2</sub> emissions from biomass can potentially lead to confusion in accounting for and understanding the flow of CO<sub>2</sub> emissions within energy and non-energy systems. In recognition of this issue, reporting of CO<sub>2</sub> emissions from biomass combustion alongside other energy-related CO<sub>2</sub> 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<sub>2</sub> emissions from biomass and energy-related CO<sub>2</sub> 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.

## Section 12 Methodology and Sources

To estimate carbon dioxide emissions from energy consumption for the *Monthly Energy Review (MER)*, Tables 12.1–12.7, the U.S. Energy Information Administration (EIA) uses the following methodology and sources:

### Step 1. Determine Fuel Consumption

Coal—Coal sectoral (residential, commercial, coke plants, other industrial, transportation, electric power) consumption data in thousand short tons are from MER Table 6.2. Coal sectoral consumption data are converted to trillion Btu by multiplying by the coal heat content factors in MER Table A5.

Coal Coke Net Imports—Coal coke net imports data in trillion Btu are derived from coal coke imports and exports data in MER Tables 1.4a and 1.4b.

Natural Gas (excluding supplemental gaseous fuels)—Natural gas sectoral consumption data in trillion Btu are from MER Tables 2.2–2.6.

Petroleum—Total and sectoral consumption (product supplied) data in thousand barrels per day for asphalt and road oil, aviation gasoline, distillate fuel oil, hydrocarbon gas liquids (HGL), jet fuel, kerosene, lubricants, motor gasoline, petroleum coke, and residual fuel oil are from MER Tables 3.5 and 3.7a–3.7c. For the component products of HGL (ethane/ethylene, propane/propylene, normal butane/butylene, isobutane/isobutylene, and natural gasoline) and "other petroleum" (aviation gasoline blending components, crude oil, motor gasoline blending components, naphthas for petrochemical feedstock use, other oils for petrochemical feedstock use, special naphthas, still gas, unfinished oils, waxes, and miscellaneous petroleum products), consumption (product supplied) data in thousand barrels per day are from EIA's *Petroleum Supply Annual (PSA)*, *Petroleum Supply Monthly (PSM)*, and

earlier publications (see sources for MER Table 3.5). Petroleum consumption data by product are converted to trillion Btu by multiplying by the petroleum heat content factors in MER Tables A1 and A3.

Biomass—Sectoral consumption data in trillion Btu for wood, biomass waste, fuel ethanol (minus denaturant), and biodiesel are from MER Tables 10.2a–10.2c.

## **Step 2. Remove Biofuels From Petroleum**

Distillate Fuel Oil—Beginning in 2009, the distillate fuel oil data (for total and transportation sector) in Step 1 include biodiesel, a non-fossil renewable fuel. To remove the biodiesel portion from distillate fuel oil, data in thousand barrels per day for refinery and blender net inputs of renewable diesel fuel (from the PSA/PSM) are converted to trillion Btu by multiplying by the biodiesel heat content factor in MER Table A1, and then subtracted from the distillate fuel oil consumption values.

Motor Gasoline—Beginning in 1993, the motor gasoline data (for total, commercial sector, industrial sector, and transportation sector) in Step 1 include fuel ethanol, a non-fossil renewable fuel. To remove the fuel ethanol portion from motor gasoline, data in trillion Btu for fuel ethanol consumption (from MER Tables 10.2a, 10.2b, and 10.3) are subtracted from the motor gasoline consumption values. (Note that about 2% of fuel ethanol is fossil-based petroleum denaturant, to make the fuel ethanol undrinkable. For 1993–2008, petroleum denaturant is double counted in the PSA product supplied statistics, in both the original product category—e.g., natural gasoline—and also in the finished motor gasoline category; for this time period for MER Section 12, petroleum denaturant is removed along with the fuel ethanol from motor gasoline, but left in the original product. Beginning in 2009, petroleum denaturant is counted only in the PSA/PSM product supplied statistics for motor gasoline; for this time period for MER Section 12, petroleum denaturant is left in motor gasoline.)

## **Step 3. Remove Carbon Sequestered by Non-Combustion Use**

The following fuels have industrial non-combustion uses as chemical feedstocks and other products: coal, natural gas, asphalt and road oil, distillate fuel oil, hydrocarbon gas liquids (ethane/ethylene, propane/propylene, normal butane/butylene, isobutane/isobutylene, and natural gasoline), lubricants (which have industrial and transportation non-combustion uses), naphthas for petrochemical feedstock use, other oils for petrochemical feedstock use, petroleum coke, residual fuel oil, special naphthas, still gas, waxes, and miscellaneous petroleum products. In the non-combustion use of these fuels, some of the carbon is sequestered, and is thus subtracted from the fuel consumption values in Steps 1 and 2.

Estimates of annual non-combustion use and associated carbon sequestration are developed by EIA using the methodology detailed in “Documentation for *Emissions of Greenhouse Gases in the United States 2008*” at [http://www.eia.gov/environment/archive/1605/ggrpt/documentation/pdf/0638\(2008\).pdf](http://www.eia.gov/environment/archive/1605/ggrpt/documentation/pdf/0638(2008).pdf).

To obtain monthly estimates of non-combustion use and associated carbon sequestration, monthly patterns for industrial consumption and product supplied data series are used. For coal non-combustion use, the monthly pattern for coke plants coal consumption from MER Table 6.2 is used. For natural gas, the monthly pattern for other industrial non-CHP natural gas consumption from MER Table 4.3 is used. For distillate fuel oil, petroleum coke, and residual fuel oil, the monthly patterns for industrial consumption from MER Table 3.7b are used. For the other petroleum products, the monthly patterns for product supplied from the PSA and PSM are used. See Tables 1.11a and 1.11b for estimates of fossil fuel non-combustion uses.

## **Step 4. Determine Carbon Dioxide Emissions From Energy Consumption**

Carbon dioxide (CO<sub>2</sub>) emissions data in million metric tons are calculated by multiplying consumption values in trillion Btu from Steps 1 and 2 (minus the carbon sequestered in non-combustion use in Step 3) by the CO<sub>2</sub> emissions factors at [http://www.eia.gov/environment/archive/1605/ggrpt/excel/CO2\\_coeffis\\_09\\_v2.xls](http://www.eia.gov/environment/archive/1605/ggrpt/excel/CO2_coeffis_09_v2.xls).

Coal—CO<sub>2</sub> emissions for coal are calculated for each sector (residential, commercial, coke plants, other industrial, transportation, electric power). Total coal emissions are the sum of the sectoral coal emissions.

Coal Coke Net Imports—CO<sub>2</sub> emissions for coal coke net imports are calculated.

Natural Gas—CO<sub>2</sub> emissions for natural gas are calculated for each sector (residential, commercial, industrial, transportation, electric power). Total natural gas emissions are the sum of the sectoral natural gas emissions.

Petroleum—CO<sub>2</sub> emissions are calculated for each petroleum product. Total petroleum emissions are the sum of the product emissions. Total HGL emissions are the sum of the emissions for the component products (ethane/ethylene, propane/propylene, normal butane/butylene, isobutane/isobutylene, and natural gasoline); residential, commercial, and transportation sector HGL emissions are estimated by multiplying consumption values in trillion Btu from MER Tables 3.8a and 3.8c by the propane emissions factor; industrial sector HGL emissions are estimated as total HGL emissions minus emissions by the other sectors.

Geothermal and Non-Biomass Waste—Annual CO<sub>2</sub> emissions data for geothermal and non-biomass waste are EIA estimates based on Form EIA-923, “Power Plant Operations Report” (and predecessor forms). Monthly estimates are created by dividing the annual data by the number of

days in the year and then multiplying by the number of days in the month. (Annual estimates for the current year are set equal to those of the previous year.)

Biomass—CO<sub>2</sub> emissions for wood, biomass waste, fuel ethanol (minus denaturant), and biodiesel are calculated for each sector. Total emissions for each biomass fuel are the sum of the sectoral emissions. The following factors, in million metric tons CO<sub>2</sub> per quadrillion Btu, are used: wood

—93.80; biomass waste—90.70; fuel ethanol—68.44; and biodiesel—73.84. For 1973–1988, the biomass portion of waste in MER Tables 10.2a–10.2c is estimated as 67%; for 1989–2000, the biomass portion of waste is estimated as 67% in 1989 to 58% in 2000, based on the biogenic shares of total municipal solid waste shown in EIA’s “Methodology for Allocating Municipal Solid Waste to Biogenic and Non-Biogenic Energy,” Table 1 at <http://www.eia.gov/totalenergy/data/monthly/pdf/historical/msw.pdf>.

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