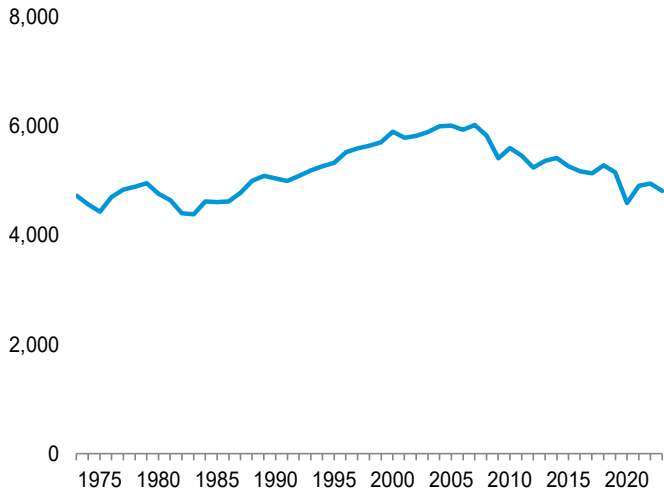


11. Environment

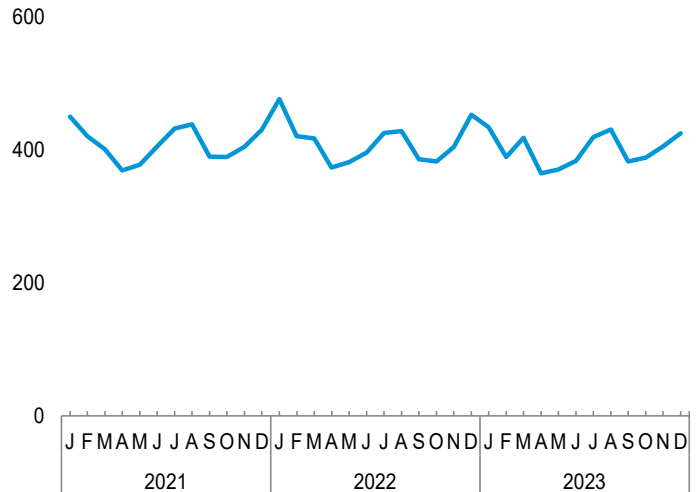
Figure 11.1 Carbon Dioxide Emissions From Energy Consumption by Source

(Million Metric Tons of Carbon Dioxide)

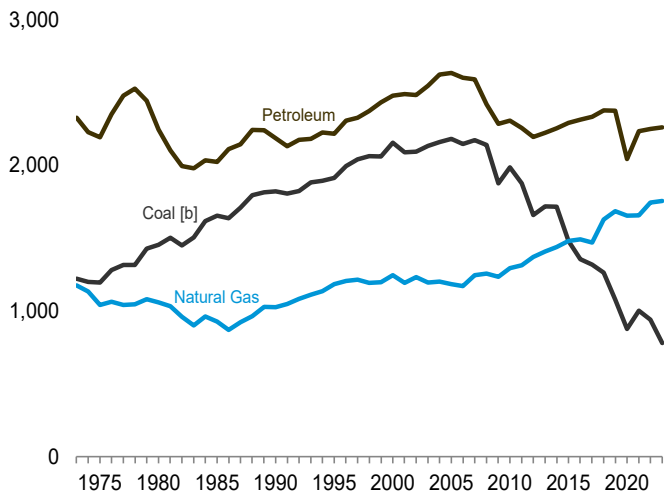
Total [a], 1973–2023



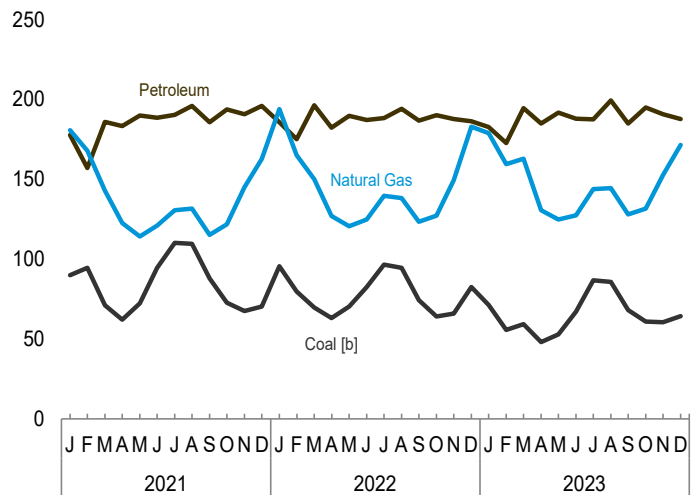
Total [a], Monthly



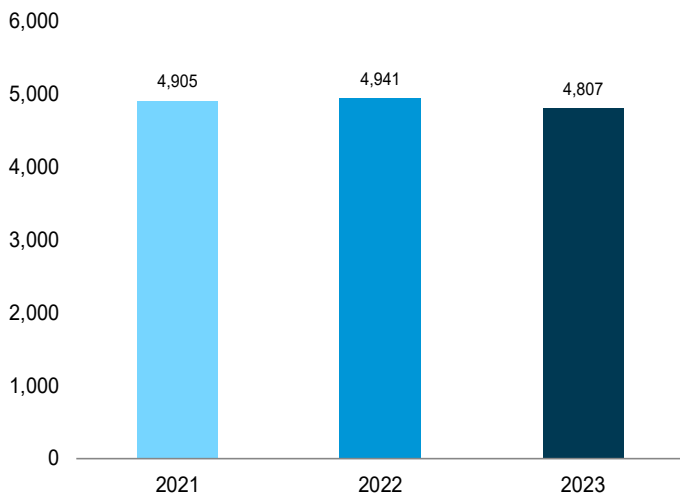
By Major Source, 1973–2023



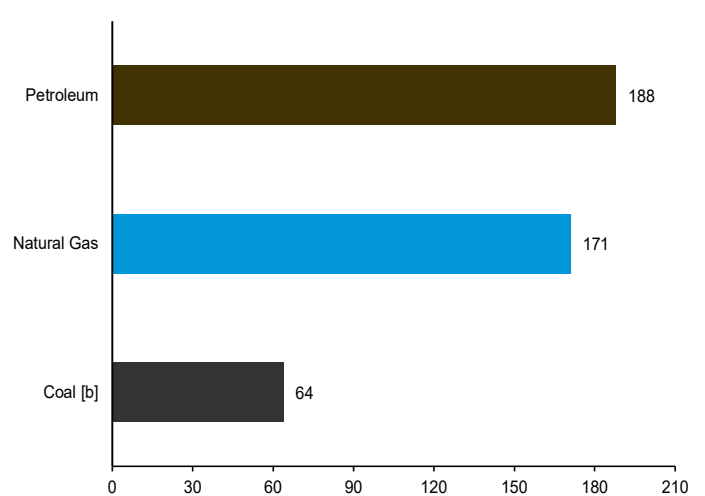
By Major Source, Monthly



Total [a], January–December



By Major Source, December 2023



[a] Excludes emissions from biomass energy consumption.
 [b] Includes coal coke net imports.

Web Page: <http://www.eia.gov/totalenergy/data/monthly/#environment>.
 Source: Table 11.1.

Table 11.1 Carbon Dioxide Emissions From Energy Consumption by Source
(Million Metric Tons of Carbon Dioxide^a)

	Coal ^b	Natural Gas ^c	Petroleum										Total	Total ^{h,i}
			Aviation Gasoline	Distillate Fuel Oil ^d	HGL ^e	Jet Fuel	Kero-sene	Lubri-cants	Motor Gasoline ^f	Petroleum Coke	Residual Fuel Oil	Other ^g		
1973 Total	1,221	1,175	6	485	80	154	33	13	911	55	486	102	2,325	4,721
1975 Total	1,195	1,043	5	447	73	146	24	11	911	52	424	97	2,190	4,428
1980 Total	1,454	1,058	4	451	78	156	24	13	901	50	433	134	2,244	4,756
1985 Total	1,655	927	3	450	82	178	17	12	933	56	207	86	2,024	4,605
1990 Total	1,820	1,026	3	475	75	223	6	13	988	72	212	119	2,186	5,038
1995 Total	1,912	1,185	3	504	90	222	8	13	1,042	78	147	111	2,216	5,324
2000 Total	2,155	1,246	3	592	106	259	10	14	1,141	85	157	111	2,477	5,889
2005 Total	2,180	1,182	2	653	92	251	11	12	1,205	110	159	140	2,633	6,007
2006 Total	2,146	1,170	2	658	86	244	8	11	1,217	106	119	151	2,602	5,929
2007 Total	2,171	1,245	2	657	90	242	5	12	1,209	99	125	147	2,588	6,016
2008 Total	2,139	1,255	2	619	89	231	2	11	1,134	94	107	130	2,418	5,823
2009 Total	1,875	1,233	2	563	86	208	3	10	1,127	87	88	111	2,284	5,404
2010 Total	1,986	1,292	2	591	84	214	3	11	1,107	81	92	119	2,304	5,594
2011 Total	1,876	1,312	2	600	79	213	2	10	1,074	78	79	118	2,255	5,455
2012 Total	1,658	1,372	2	577	76	210	1	9	1,066	78	64	114	2,195	5,236
2013 Total	1,718	1,408	2	581	85	214	1	10	1,077	77	55	120	2,221	5,359
2014 Total	1,713	1,438	2	614	86	220	1	10	1,085	77	44	112	2,252	5,414
2015 Total	1,482	1,479	1	606	86	231	1	11	1,114	77	45	116	2,290	5,262
2016 Total	1,355	1,490	1	583	83	242	1	11	1,134	77	56	124	2,312	5,169
2017 Total	1,318	1,471	1	591	86	251	1	10	1,131	71	59	130	2,332	5,132
2018 Total	1,263	1,627	2	626	98	255	1	10	1,131	73	55	127	2,377	5,278
2019 Total	1,078	1,685	2	621	107	261	1	9	1,128	67	47	131	2,374	5,147
2020 Total	876	1,653	1	572	105	161	1	8	977	58	36	123	2,044	4,584
2021 January	90	181	(s)	52	13	14	(s)	1	80	5	4	9	178	450
February	95	168	(s)	47	10	12	(s)	1	73	3	3	8	157	420
March	71	143	(s)	53	10	15	(s)	1	88	5	4	11	186	401
April	62	123	(s)	51	8	16	(s)	1	88	4	2	13	183	369
May	72	114	(s)	51	8	16	(s)	1	93	7	4	10	190	377
June	94	121	(s)	50	8	18	(s)	1	93	6	5	9	189	405
July	110	131	(s)	48	8	19	(s)	1	95	4	5	10	190	432
August	110	132	(s)	52	8	20	(s)	1	94	6	5	9	196	438
September	88	115	(s)	51	8	18	(s)	1	89	5	5	9	186	390
October	73	122	(s)	52	9	19	(s)	1	92	5	5	11	194	389
November	67	145	(s)	53	10	19	(s)	1	89	5	6	8	191	404
December	70	163	(s)	52	12	19	(s)	1	91	6	6	9	196	430
Total	1,003	1,656	1	611	111	205	1	9	1,067	60	54	116	2,235	4,905
2022 January	96	194	(s)	54	12	18	(s)	1	83	5	4	9	186	476
February	80	165	(s)	52	10	16	(s)	1	80	4	4	8	175	421
March	70	150	(s)	55	9	19	(s)	1	93	5	5	9	196	417
April	63	127	(s)	50	7	19	(s)	1	88	4	4	9	182	373
May	70	121	(s)	51	6	20	(s)	1	94	4	5	10	190	382
June	83	125	(s)	51	6	21	(s)	1	90	4	5	9	187	395
July	96	140	(s)	49	7	20	(s)	(s)	91	7	5	10	188	425
August	94	138	(s)	51	6	21	(s)	1	93	5	5	10	194	428
September	74	124	(s)	52	6	19	(s)	1	88	5	7	9	187	386
October	64	127	(s)	54	7	20	(s)	1	90	4	4	9	190	382
November	66	149	(s)	51	9	19	(s)	1	88	6	5	9	188	404
December	82	183	(s)	50	10	20	(s)	1	88	4	4	9	186	452
Total	939	1,742	2	619	96	233	1	9	1,065	57	57	111	2,249	4,941
2023 January	71	179	(s)	R 52	10	19	(s)	1	85	2	4	9	R 183	R 434
February	56	159	(s)	R 48	9	17	(s)	1	81	4	5	8	R 173	R 389
March	59	163	(s)	54	9	20	(s)	(s)	92	6	4	9	R 195	R 418
April	48	131	(s)	R 50	7	20	(s)	1	90	6	2	9	R 185	364
May	53	125	(s)	R 52	7	21	(s)	1	93	4	3	10	R 192	370
June	67	127	(s)	50	7	21	(s)	1	92	3	4	9	R 188	R 383
July	87	144	(s)	48	7	22	(s)	1	93	3	4	10	187	R 419
August	86	144	(s)	R 55	6	22	(s)	1	95	6	5	10	199	430
September	68	128	(s)	R 50	6	21	(s)	1	88	7	3	9	R 185	R 382
October	61	132	(s)	R 54	8	21	(s)	1	93	5	4	9	R 195	388
November	61	153	(s)	51	R 10	20	(s)	(s)	88	8	5	9	R 191	R 405
December	64	171	(s)	48	10	21	(s)	(s)	91	3	5	9	188	424
Total	781	1,756	1	612	95	247	2	7	1,081	56	47	111	2,259	4,807

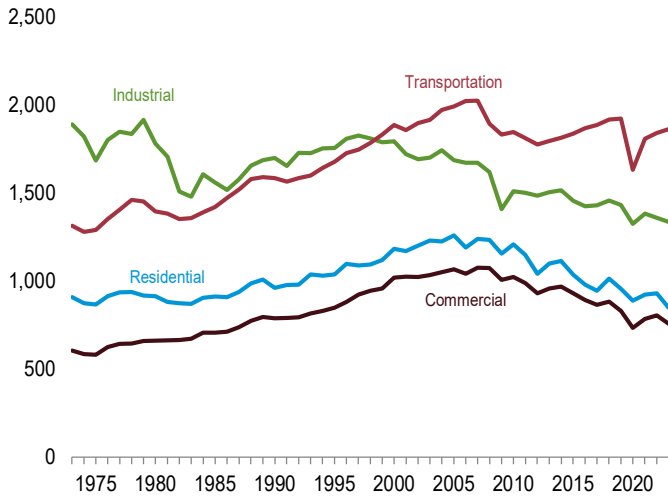
^a Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.
^b Includes coal coke net imports.
^c Natural gas, excluding supplemental gaseous fuels.
^d Distillate fuel oil, excluding biodiesel.
^e Hydrocarbon gas liquids.
^f Finished motor gasoline, excluding fuel ethanol.
^g Aviation gasoline blending components, crude oil, motor gasoline blending components, petrochemical feedstocks, special naphthas, still gas, unfinished oils, waxes, and miscellaneous petroleum products.
^h Includes electric power sector use of geothermal energy and non-biomass waste. See Table 11.6.
ⁱ Excludes emissions from biomass energy consumption. See Table 11.7.

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 11 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 11.7 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.

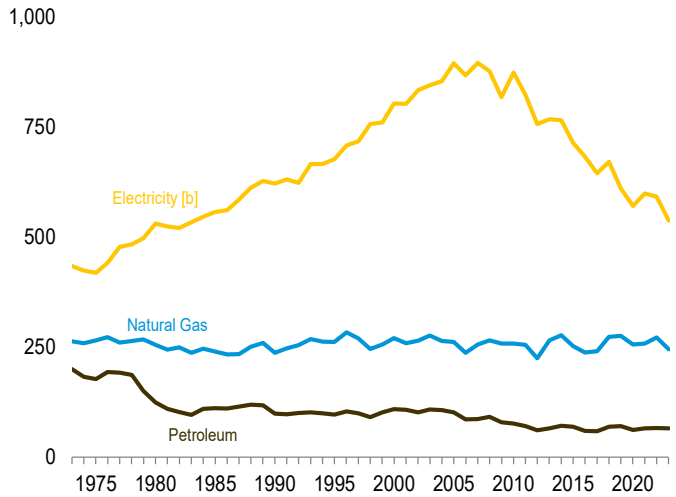
Figure 11.2 Carbon Dioxide Emissions From Energy Consumption by Sector

(Million Metric Tons of Carbon Dioxide)

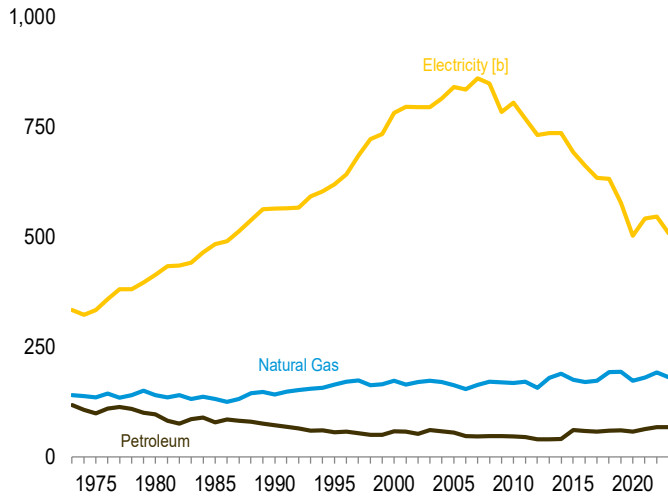
Total [a] by End-Use Sector [b], 1973–2023



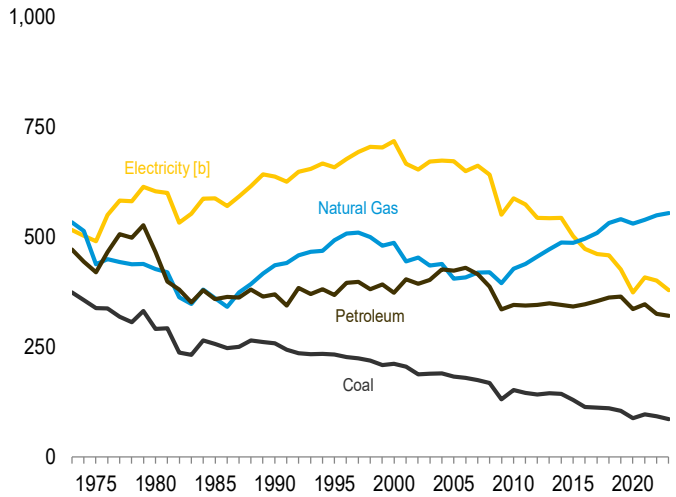
Residential Sector by Major Source, 1973–2023



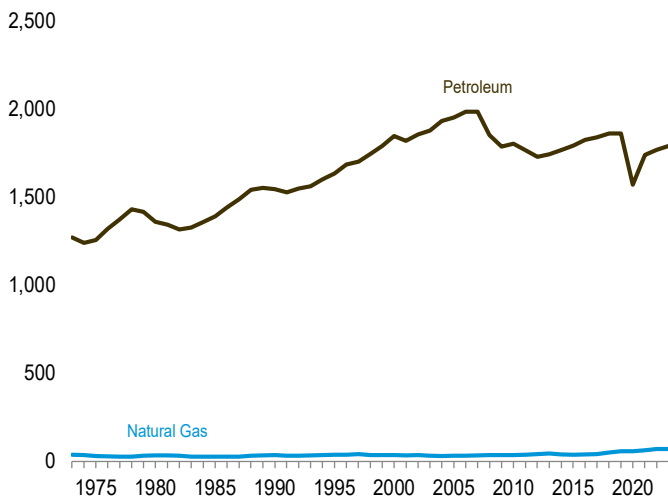
Commercial Sector by Major Source, 1973–2023



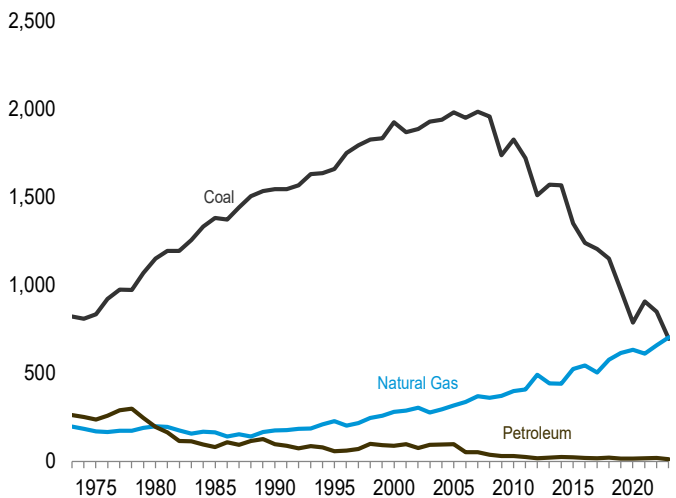
Industrial Sector by Major Source, 1973–2023



Transportation Sector by Major Source, 1973–2023



Electric Power Sector by Major Source, 1973–2023



[a] Excludes emissions from biomass energy consumption.

[b] 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 sales to ultimate customers.

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

Sources: Tables 11.2–11.6.

Table 11.2 Carbon Dioxide Emissions From Energy Consumption: Residential Sector
(Million Metric Tons of Carbon Dioxide^a)

	Coal	Natural Gas ^b	Petroleum				Electricity ^e	Total ^f
			Distillate Fuel Oil ^c	HGL ^d	Kerosene	Total		
1973 Total	9	264	148	36	17	201	435	908
1975 Total	6	266	134	32	12	178	419	869
1980 Total	3	256	97	20	8	125	531	915
1985 Total	4	240	81	20	12	112	557	913
1990 Total	3	238	72	22	5	99	622	962
1995 Total	2	263	67	25	5	97	677	1,039
2000 Total	1	271	68	35	7	109	804	1,185
2005 Total	1	262	64	32	6	102	895	1,260
2006 Total	1	237	53	28	5	86	868	1,191
2007 Total	1	256	54	30	3	87	896	1,240
2008 Total	NA	266	56	35	2	92	877	1,234
2009 Total	NA	259	43	34	2	80	818	1,157
2010 Total	NA	259	42	33	2	77	874	1,210
2011 Total	NA	255	39	31	1	71	823	1,149
2012 Total	NA	225	36	25	1	61	757	1,043
2013 Total	NA	266	36	29	1	66	767	1,100
2014 Total	NA	278	40	31	1	71	766	1,115
2015 Total	NA	253	41	28	1	70	714	1,037
2016 Total	NA	238	32	27	1	60	683	981
2017 Total	NA	241	32	27	1	60	645	946
2018 Total	NA	274	38	32	1	70	672	1,015
2019 Total	NA	276	35	35	1	71	611	958
2020 Total	NA	256	30	31	1	62	571	890
2021 January	NA	49	5	5	(s)	10	56	115
February	NA	48	5	5	(s)	10	56	114
March	NA	31	4	3	(s)	7	41	80
April	NA	19	3	2	(s)	5	34	58
May	NA	12	2	2	(s)	4	39	55
June	NA	7	2	1	(s)	3	58	68
July	NA	6	1	1	(s)	2	71	80
August	NA	6	1	1	(s)	2	72	80
September	NA	6	2	1	(s)	3	53	63
October	NA	11	3	2	(s)	5	41	56
November	NA	26	3	3	(s)	7	38	71
December	NA	37	4	4	(s)	8	43	88
Total	NA	259	35	30	1	66	599	924
2022 January	NA	53	5	5	(s)	10	60	123
February	NA	43	6	4	(s)	10	49	102
March	NA	32	4	3	(s)	7	39	79
April	NA	21	3	2	(s)	5	34	60
May	NA	11	2	1	(s)	4	41	56
June	NA	7	2	1	(s)	3	55	65
July	NA	6	1	1	(s)	2	71	79
August	NA	6	1	1	(s)	2	68	76
September	NA	6	2	1	(s)	3	50	59
October	NA	13	3	2	(s)	5	37	55
November	NA	28	3	3	(s)	6	39	73
December	NA	46	4	5	(s)	9	54	108
Total	NA	272	36	31	1	67	592	931
2023 January	NA	44	5	4	(s)	10	49	102
February	NA	37	6	4	(s)	10	38	85
March	NA	35	4	4	(s)	8	38	80
April	NA	18	3	2	(s)	5	31	55
May	NA	11	2	2	(s)	4	35	49
June	NA	7	2	1	(s)	3	47	57
July	NA	6	1	1	(s)	2	R 67	R 76
August	NA	6	1	1	(s)	2	67	R 74
September	NA	6	2	1	(s)	3	50	59
October	NA	12	3	2	(s)	5	R 37	R 54
November	NA	27	3	3	(s)	6	38	71
December	NA	36	4	4	(s)	8	44	88
Total	NA	246	35	29	1	66	538	849

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

^b Natural gas, excluding supplemental gaseous fuels.

^c Distillate fuel oil, excluding biodiesel.

^d Hydrocarbon gas liquids.

^e 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 sales to ultimate customers. See Tables 7.6 and 11.6.

^f Excludes emissions from biomass energy consumption. See Table 11.7.

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 11 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 11.7 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 11.3 Carbon Dioxide Emissions From Energy Consumption: Commercial Sector
(Million Metric Tons of Carbon Dioxide^a)

	Coal	Natural Gas ^b	Petroleum						Electricity ^f	Total ^g	
			Distillate Fuel Oil ^c	HGL ^d	Kerosene	Motor Gasoline ^e	Petroleum Coke	Residual Fuel Oil			Total
1973 Total	15	140	48	9	5	6	NA	50	118	334	607
1975 Total	14	136	43	8	4	6	NA	37	98	334	582
1980 Total	11	141	38	6	3	8	NA	42	97	414	662
1985 Total	13	132	47	6	2	7	NA	17	79	484	708
1990 Total	12	142	40	6	1	8	0	17	72	564	790
1995 Total	11	164	35	7	2	1	(s)	11	56	619	850
2000 Total	9	172	37	9	2	3	(s)	7	58	781	1,021
2005 Total	9	163	33	8	2	3	(s)	9	55	840	1,067
2006 Total	6	154	30	8	1	3	(s)	6	48	834	1,042
2007 Total	7	164	28	8	1	4	(s)	6	46	860	1,077
2008 Total	8	171	29	10	(s)	3	(s)	5	47	848	1,074
2009 Total	7	169	29	9	(s)	3	(s)	5	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	40	736	958
2014 Total	4	189	26	10	(s)	4	(s)	1	41	736	970
2015 Total	3	175	27	9	(s)	25	(s)	(s)	61	692	932
2016 Total	2	171	24	9	(s)	25	(s)	(s)	59	661	893
2017 Total	2	173	24	10	(s)	24	(s)	(s)	58	633	866
2018 Total	2	193	24	11	(s)	24	(s)	(s)	59	632	885
2019 Total	2	193	24	11	(s)	24	(s)	(s)	60	578	832
2020 Total	1	173	20	13	(s)	24	(s)	(s)	58	502	735
2021 January	(s)	27	3	2	(s)	2	0	(s)	7	43	77
February	(s)	27	3	2	(s)	2	(s)	(s)	7	44	78
March	(s)	20	3	1	(s)	2	(s)	(s)	6	37	63
April	(s)	14	2	1	(s)	2	0	(s)	5	35	54
May	(s)	10	2	1	(s)	2	0	(s)	5	40	55
June	(s)	8	1	1	(s)	2	0	(s)	4	52	64
July	(s)	8	1	1	(s)	2	0	(s)	4	59	71
August	(s)	8	1	1	(s)	2	0	(s)	4	60	71
September	(s)	8	1	1	(s)	2	0	(s)	4	48	61
October	(s)	11	2	1	(s)	2	(s)	(s)	5	44	60
November	(s)	18	2	1	(s)	2	(s)	(s)	6	39	64
December	(s)	22	3	2	(s)	2	(s)	(s)	7	39	68
Total	1	180	24	14	(s)	25	(s)	(s)	63	541	786
2022 January	(s)	30	3	2	(s)	2	(s)	(s)	R 8	48	86
February	(s)	25	4	2	(s)	2	(s)	(s)	R 8	40	73
March	(s)	21	3	1	(s)	R 3	(s)	(s)	R 7	38	66
April	(s)	15	2	1	(s)	2	(s)	(s)	5	36	R 57
May	(s)	10	2	1	(s)	R 3	(s)	(s)	5	42	57
June	(s)	8	1	1	(s)	2	(s)	(s)	4	49	R 62
July	(s)	8	1	1	(s)	2	(s)	(s)	4	58	70
August	(s)	8	1	1	(s)	R 3	0	(s)	4	57	69
September	(s)	8	1	1	(s)	2	(s)	(s)	4	48	R 61
October	(s)	12	2	1	(s)	2	0	(s)	5	42	59
November	(s)	19	2	1	(s)	2	(s)	(s)	R 6	40	R 66
December	(s)	27	3	2	(s)	2	(s)	(s)	7	46	R 81
Total	1	192	25	14	(s)	R 29	(s)	(s)	R 68	546	R 807
2023 January	(s)	26	3	2	(s)	2	(s)	(s)	R 8	41	74
February	(s)	23	4	R 2	(s)	2	(s)	(s)	R 8	34	65
March	(s)	22	3	R 2	(s)	R 3	(s)	(s)	R 7	38	R 67
April	(s)	14	2	1	(s)	2	0	(s)	5	33	52
May	(s)	10	2	1	(s)	R 3	0	(s)	5	38	53
June	(s)	8	1	1	(s)	2	0	(s)	4	45	58
July	(s)	8	1	1	(s)	R 3	0	(s)	4	56	68
August	(s)	8	1	1	(s)	R 3	0	(s)	4	56	R 68
September	(s)	8	1	1	(s)	2	0	(s)	4	46	R 59
October	(s)	12	2	1	(s)	R 3	0	(s)	5	42	59
November	(s)	19	2	1	(s)	2	0	(s)	R 6	39	64
December	(s)	23	3	2	(s)	2	(s)	(s)	7	40	70
Total	1	181	24	13	(s)	29	(s)	(s)	67	508	758

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

^b Natural gas, excluding supplemental gaseous fuels.

^c Distillate fuel oil, excluding biodiesel.

^d Hydrocarbon gas liquids.

^e Finished motor gasoline, excluding fuel ethanol.

^f 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 sales to ultimate customers. See Tables 7.6 and 11.6.

^g Excludes emissions from biomass energy consumption. See Table 11.7.

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 11 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 11.7 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 11.4 Carbon Dioxide Emissions From Energy Consumption: Industrial Sector
(Million Metric Tons of Carbon Dioxide^a)

	Coal	Coal Coke Net Imports	Natural Gas ^b	Petroleum								Elec- tricity ^g	Total ^h	
				Distillate Fuel Oil ^c	HGL ^d	Kero- sene	Lubri- cants	Motor Gasoline ^e	Petroleum Coke	Residual Fuel Oil	Other ^f			Total
1973 Total	373	-1	533	107	31	11	7	18	54	139	102	471	515	1,891
1975 Total	338	2	437	98	30	9	6	16	52	113	97	420	490	1,687
1980 Total	291	-4	427	97	52	13	7	11	50	101	134	465	604	1,782
1985 Total	257	-2	361	82	54	3	6	16	55	56	86	358	587	1,561
1990 Total	258	1	435	85	45	1	7	13	69	31	119	369	636	1,699
1995 Total	232	7	492	83	57	1	7	14	69	25	111	368	658	1,757
2000 Total	211	7	486	89	61	1	7	11	75	18	111	373	717	1,795
2005 Total	182	5	405	94	49	3	6	25	86	21	140	423	671	1,687
2006 Total	180	7	407	93	49	2	6	26	85	18	151	430	649	1,673
2007 Total	175	3	419	93	50	1	6	21	83	14	147	415	661	1,673
2008 Total	168	5	419	99	41	(s)	6	17	79	15	130	387	641	1,619
2009 Total	131	-3	395	79	41	(s)	5	16	73	10	111	336	550	1,409
2010 Total	152	-1	428	85	42	1	5	17	67	9	119	345	587	1,512
2011 Total	146	1	438	91	39	(s)	5	17	64	10	118	344	574	1,503
2012 Total	142	(s)	455	94	42	(s)	4	17	69	5	114	346	543	1,486
2013 Total	145	-2	472	94	46	(s)	5	17	64	4	120	349	542	1,505
2014 Total	144	-2	487	101	45	(s)	5	14	65	3	112	345	543	1,516
2015 Total	129	-2	486	87	48	(s)	5	17	66	2	116	342	502	1,457
2016 Total	113	-2	496	86	46	(s)	5	17	65	4	124	347	472	1,426
2017 Total	112	-3	509	89	48	(s)	5	17	61	4	130	354	461	1,432
2018 Total	111	-3	532	93	54	(s)	5	18	62	3	127	362	457	1,459
2019 Total	105	-2	540	89	60	(s)	4	18	60	3	131	364	425	1,432
2020 Total	88	-1	530	79	60	(s)	4	18	49	2	123	336	374	1,326
2021 January	8	(s)	50	9	6	(s)	(s)	1	4	(s)	9	30	33	121
February	8	(s)	43	6	3	(s)	(s)	1	2	(s)	8	21	33	104
March	8	(s)	46	9	5	(s)	(s)	1	4	(s)	11	30	28	112
April	8	(s)	44	8	5	(s)	(s)	1	3	(s)	13	31	29	111
May	8	(s)	43	7	6	(s)	(s)	2	6	(s)	10	30	32	114
June	8	-1	42	6	6	(s)	(s)	2	5	(s)	9	29	38	116
July	8	(s)	44	5	6	(s)	(s)	2	3	(s)	10	26	42	120
August	8	-1	44	7	6	(s)	(s)	2	6	(s)	9	31	42	124
September	8	-1	42	8	6	(s)	(s)	1	4	(s)	9	29	35	114
October	8	(s)	45	7	6	(s)	(s)	2	4	(s)	11	30	33	116
November	8	-1	47	9	5	(s)	(s)	1	4	(s)	8	29	31	115
December	8	-1	50	7	6	(s)	(s)	1	6	(s)	9	30	30	117
Total	97	-6	539	88	67	(s)	4	17	51	3	116	347	408	1,385
2022 January	8	-1	52	9	5	(s)	(s)	1	4	(s)	9	28	36	123
February	8	(s)	46	8	4	(s)	(s)	1	3	(s)	8	25	30	108
March	8	-1	48	9	4	(s)	(s)	2	4	(s)	9	29	29	114
April	8	-1	45	7	4	(s)	(s)	1	4	(s)	9	26	28	107
May	8	-1	44	6	4	(s)	(s)	2	3	(s)	10	25	32	109
June	8	(s)	43	7	4	(s)	(s)	R 2	3	(s)	9	R 27	36	112
July	8	-1	44	5	5	(s)	(s)	R 2	6	(s)	10	28	39	118
August	8	(s)	44	7	4	(s)	(s)	2	5	(s)	10	28	39	119
September	7	-1	43	8	5	(s)	(s)	1	4	(s)	9	29	33	112
October	8	(s)	45	9	4	(s)	(s)	R 2	3	(s)	9	27	32	111
November	8	(s)	47	8	4	(s)	(s)	1	5	(s)	9	28	31	113
December	8	-1	49	5	4	(s)	(s)	R 2	3	(s)	9	23	33	112
Total	93	-6	549	89	51	(s)	4	R 18	48	3	111	R 325	401	1,360
2023 January	8	(s)	49	8	4	(s)	(s)	1	2	(s)	9	25	29	R 111
February	7	(s)	45	6	3	(s)	(s)	1	3	(s)	8	R 23	26	R 101
March	8	(s)	49	R 9	R 3	(s)	(s)	2	5	(s)	9	R 29	29	R 114
April	7	(s)	46	7	4	(s)	(s)	R 2	5	(s)	9	R 28	26	R 107
May	7	(s)	45	7	4	(s)	(s)	2	4	(s)	10	R 28	30	R 109
June	7	(s)	43	R 7	5	(s)	(s)	R 2	3	(s)	9	26	34	R 110
July	7	(s)	44	R 5	5	(s)	(s)	2	2	(s)	10	R 24	39	113
August	7	(s)	45	R 9	5	(s)	(s)	2	5	(s)	10	R 31	R 39	R 122
September	7	(s)	44	7	R 5	(s)	(s)	1	6	(s)	9	29	R 33	R 113
October	8	(s)	46	8	5	(s)	(s)	2	4	(s)	9	R 29	R 32	R 114
November	7	(s)	48	8	5	(s)	(s)	1	8	(s)	9	R 32	R 31	R 117
December	7	(s)	51	5	5	(s)	(s)	2	3	(s)	9	23	30	111
Total	86	-3	554	88	53	(s)	3	18	51	3	111	327	379	1,342

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

^b Natural gas, excluding supplemental gaseous fuels.

^c Distillate fuel oil, excluding biodiesel.

^d Hydrocarbon gas liquids.

^e Finished motor gasoline, excluding fuel ethanol.

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

^g 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 sales to ultimate customers. See Tables 7.6 and 11.6.

^h Excludes emissions from biomass energy consumption. See Table 11.7.

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 11 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 11.7 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 11.5 Carbon Dioxide Emissions From Energy Consumption: Transportation Sector
(Million Metric Tons of Carbon Dioxide^a)

	Coal	Natural Gas ^b	Petroleum							Electricity ^f	Total ^g	
			Aviation Gasoline	Distillate Fuel Oil ^c	HGL ^d	Jet Fuel	Lubricants	Motor Gasoline ^e	Residual Fuel Oil			Total
1973 Total	(s)	39	6	164	3	152	6	887	55	1,272	2	1,314
1975 Total	(s)	32	5	157	3	144	6	889	53	1,257	2	1,291
1980 Total	(h)	34	4	207	1	155	6	882	105	1,361	2	1,397
1985 Total	(h)	28	3	234	2	178	6	910	59	1,393	3	1,423
1990 Total	(h)	36	3	271	1	223	7	967	76	1,548	3	1,587
1995 Total	(h)	38	3	310	1	222	6	1,026	68	1,637	3	1,679
2000 Total	(h)	36	3	386	1	259	7	1,128	67	1,848	4	1,888
2005 Total	(h)	33	2	453	2	251	6	1,177	63	1,954	5	1,992
2006 Total	(h)	33	2	476	2	244	5	1,188	68	1,985	5	2,023
2007 Total	(h)	35	2	476	1	242	6	1,184	75	1,986	5	2,026
2008 Total	(h)	37	2	430	3	231	5	1,114	70	1,854	5	1,896
2009 Total	(h)	38	2	406	2	208	5	1,107	59	1,789	5	1,832
2010 Total	(h)	38	2	429	(s)	214	6	1,086	67	1,804	5	1,847
2011 Total	(h)	39	2	436	(s)	213	5	1,054	58	1,769	4	1,813
2012 Total	(h)	41	2	417	(s)	210	5	1,047	50	1,730	4	1,776
2013 Total	(h)	47	2	421	(s)	214	5	1,057	44	1,744	4	1,795
2014 Total	(h)	40	2	441	(s)	220	6	1,067	34	1,769	4	1,814
2015 Total	(h)	39	1	447	1	231	6	1,073	35	1,794	4	1,837
2016 Total	(h)	40	1	437	1	242	6	1,092	47	1,825	4	1,869
2017 Total	(h)	42	1	442	1	251	5	1,090	50	1,841	4	1,887
2018 Total	(h)	51	2	466	1	255	5	1,090	45	1,864	4	1,918
2019 Total	(h)	59	2	468	1	261	5	1,086	40	1,862	3	1,924
2020 Total	(h)	59	1	439	1	161	4	935	29	1,572	3	1,633
2021 January	(h)	7	(s)	35	(s)	14	(s)	77	3	129	(s)	137
February	(h)	7	(s)	32	(s)	12	(s)	70	3	117	(s)	124
March	(h)	6	(s)	38	(s)	15	(s)	84	4	141	(s)	146
April	(h)	5	(s)	38	(s)	16	(s)	85	2	141	(s)	146
May	(h)	4	(s)	40	(s)	16	(s)	89	3	150	(s)	154
June	(h)	5	(s)	40	(s)	18	(s)	89	4	152	(s)	157
July	(h)	5	(s)	41	(s)	19	(s)	92	4	156	(s)	162
August	(h)	5	(s)	42	(s)	20	(s)	91	4	158	(s)	163
September	(h)	5	(s)	39	(s)	18	(s)	85	4	148	(s)	152
October	(h)	5	(s)	40	(s)	19	(s)	89	5	152	(s)	157
November	(h)	6	(s)	38	(s)	19	(s)	86	5	148	(s)	154
December	(h)	6	(s)	37	(s)	19	(s)	88	6	150	(s)	157
Total	(h)	65	1	459	1	205	4	1,025	46	1,741	3	1,809
2022 January	(h)	8	(s)	35	(s)	18	(s)	R 79	3	R 136	(s)	R 144
February	(h)	7	(s)	33	(s)	16	(s)	77	4	131	(s)	138
March	(h)	6	(s)	38	(s)	19	(s)	R 88	5	152	(s)	158
April	(h)	5	(s)	38	(s)	19	(s)	84	3	145	(s)	150
May	(h)	5	(s)	40	(s)	20	(s)	90	4	R 154	(s)	R 159
June	(h)	5	(s)	41	(s)	21	(s)	86	4	152	(s)	157
July	(h)	6	(s)	41	(s)	20	(s)	87	4	R 152	(s)	158
August	(h)	6	(s)	42	(s)	21	(s)	R 89	5	R 158	(s)	164
September	(h)	5	(s)	40	(s)	19	(s)	R 84	6	R 149	(s)	R 154
October	(h)	5	(s)	41	(s)	20	(s)	R 86	3	151	(s)	R 156
November	(h)	6	(s)	38	(s)	19	(s)	84	4	146	(s)	152
December	(h)	7	(s)	36	(s)	20	(s)	R 84	3	R 144	(s)	152
Total	(h)	70	2	464	1	233	5	R 1,018	47	R 1,770	3	R 1,842
2023 January	(h)	7	(s)	35	(s)	19	(s)	R 81	3	139	(s)	146
February	(h)	6	(s)	32	(s)	17	(s)	R 77	4	R 131	(s)	138
March	(h)	6	(s)	38	(s)	20	(s)	R 88	3	R 150	(s)	157
April	(h)	5	(s)	38	(s)	20	(s)	86	2	146	(s)	R 151
May	(h)	5	(s)	40	(s)	21	(s)	R 89	3	R 154	(s)	R 159
June	(h)	5	(s)	40	(s)	21	(s)	88	3	153	(s)	R 158
July	(h)	6	(s)	41	(s)	22	(s)	89	3	156	(s)	162
August	(h)	6	(s)	43	(s)	22	(s)	R 91	4	161	(s)	167
September	(h)	5	(s)	39	(s)	21	(s)	84	2	147	(s)	152
October	(h)	5	(s)	41	(s)	21	(s)	R 89	3	155	(s)	R 160
November	(h)	6	(s)	38	(s)	20	(s)	84	4	146	(s)	R 152
December	(h)	7	(s)	36	(s)	21	(s)	87	4	148	(s)	155
Total	(h)	70	1	460	1	247	3	1,033	39	1,786	3	1,858

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

^b Natural gas, excluding supplemental gaseous fuels.

^c Distillate fuel oil, excluding biodiesel.

^d Hydrocarbon gas liquids.

^e Finished motor gasoline, excluding fuel ethanol.

^f 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 sales to ultimate customers. See Tables 7.6 and 11.6.

^g Excludes emissions from biomass energy consumption. See Table 11.7.

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

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 11 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 11.7 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 11.6 Carbon Dioxide Emissions From Energy Consumption: Electric Power Sector
(Million Metric Tons of Carbon Dioxide^a)

	Coal	Natural Gas ^b	Petroleum				Geo-thermal	Non-Biomass Waste ^d	Total ^e
			Distillate Fuel Oil ^c	Petroleum Coke	Residual Fuel Oil	Total			
1973 Total	823	199	20	2	242	264	NA	NA	1,286
1975 Total	836	172	17	(s)	221	237	NA	NA	1,245
1980 Total	1,153	200	12	1	185	198	NA	NA	1,551
1985 Total	1,383	166	6	1	75	82	NA	NA	1,631
1990 Total	1,547	175	7	3	87	98	(s)	6	1,826
1995 Total	1,660	228	8	8	43	59	(s)	10	1,957
2000 Total	1,926	281	13	10	65	89	(s)	10	2,306
2005 Total	1,983	319	9	24	66	98	(s)	11	2,411
2006 Total	1,953	338	5	21	27	53	(s)	12	2,356
2007 Total	1,986	371	7	17	30	53	(s)	11	2,422
2008 Total	1,958	362	5	15	18	38	(s)	12	2,371
2009 Total	1,740	373	5	13	14	32	(s)	11	2,157
2010 Total	1,828	400	6	14	12	31	(s)	11	2,270
2011 Total	1,723	409	5	14	7	26	(s)	11	2,170
2012 Total	1,512	493	4	9	6	18	(s)	11	2,035
2013 Total	1,571	444	4	13	6	22	(s)	11	2,049
2014 Total	1,568	443	6	12	7	25	(s)	11	2,048
2015 Total	1,351	525	5	11	7	24	(s)	11	1,912
2016 Total	1,242	545	4	12	5	21	(s)	11	1,820
2017 Total	1,207	506	4	10	5	19	(s)	11	1,743
2018 Total	1,153	578	6	10	6	22	(s)	11	1,764
2019 Total	974	617	4	8	4	16	(s)	11	1,618
2020 Total	788	635	3	9	4	16	(s)	11	1,450
2021 January	82	47	(s)	1	(s)	2	(s)	1	132
February	87	43	1	1	(s)	2	(s)	1	133
March	63	40	(s)	1	(s)	1	(s)	1	105
April	55	42	(s)	1	(s)	1	(s)	1	98
May	65	44	(s)	1	(s)	1	(s)	1	111
June	87	59	(s)	1	(s)	1	(s)	1	149
July	102	68	(s)	1	(s)	1	(s)	1	172
August	102	69	(s)	1	1	2	(s)	1	174
September	81	54	(s)	1	(s)	1	(s)	1	137
October	65	51	(s)	1	(s)	1	(s)	1	118
November	60	47	(s)	1	(s)	2	(s)	1	109
December	63	48	(s)	1	(s)	1	(s)	1	113
Total	910	613	4	9	4	18	(s)	11	1,551
2022 January	88	52	1	1	1	3	(s)	1	143
February	72	44	(s)	1	(s)	2	(s)	1	118
March	62	42	(s)	1	(s)	1	(s)	1	107
April	56	40	(s)	1	(s)	1	(s)	1	98
May	63	50	(s)	1	(s)	1	(s)	1	116
June	75	62	(s)	1	(s)	1	(s)	1	140
July	89	77	(s)	1	(s)	1	(s)	1	168
August	87	75	(s)	1	(s)	1	(s)	1	165
September	67	61	(s)	1	(s)	2	(s)	1	131
October	57	52	(s)	1	(s)	2	(s)	1	111
November	58	49	(s)	1	(s)	1	(s)	1	110
December	75	54	2	1	1	3	(s)	1	134
Total	851	659	6	9	6	21	(s)	11	1,542
2023 January	64	53	(s)	(s)	(s)	1	(s)	1	119
February	48	47	(s)	(s)	1	1	(s)	1	98
March	52	51	(s)	(s)	(s)	1	(s)	1	104
April	41	47	(s)	(s)	(s)	1	(s)	1	90
May	46	54	(s)	(s)	(s)	1	(s)	1	102
June	60	64	(s)	(s)	(s)	1	(s)	1	126
July	80	80	(s)	1	(s)	1	(s)	1	163
August	79	80	(s)	1	(s)	1	(s)	1	161
September	62	65	(s)	1	(s)	1	(s)	1	129
October	53	55	(s)	(s)	(s)	1	(s)	1	111
November	53	53	(s)	(s)	(s)	1	(s)	1	108
December	58	55	(s)	(s)	(s)	1	(s)	1	115
Total	697	705	4	5	5	14	(s)	11	1,427

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

^b Natural gas, excluding supplemental gaseous fuels.

^c Distillate fuel oil, excluding biodiesel.

^d 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.

^e Excludes emissions from biomass energy consumption. See Table 11.7.

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

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

consumption. See "Section 11 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 11.7 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 11.7 Carbon Dioxide Emissions From Biomass Energy Consumption
(Million Metric Tons of Carbon Dioxide^a)

	By Source					By Sector					
	Wood ^b	Biomass Waste ^c	Fuel Ethanol ^d	Bio-diesel	Total	Residential	Commercial ^e	Industrial ^f	Transportation	Electric Power ^g	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
2000 Total	212	27	9	NA	248	39	9	161	9	29	248
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	182	41	62	3	288	47	10	125	64	41	288
2010 Total	208	42	73	2	325	51	10	149	74	42	325
2011 Total	208	42	73	8	331	49	11	151	80	40	331
2012 Total	202	42	73	8	325	41	10	153	80	42	325
2013 Total	219	45	75	13	353	54	11	158	87	43	353
2014 Total	225	47	76	13	361	54	12	158	88	49	361
2015 Total	217	47	79	14	357	48	13	157	90	48	357
2016 Total	209	46	81	20	355	42	14	155	98	47	355
2017 Total	205	45	82	19	351	40	14	152	98	47	351
2018 Total	212	44	82	18	356	49	14	151	97	46	356
2019 Total	210	40	83	17	350	51	13	147	97	41	350
2020 Total	185	40	72	18	314	32	13	143	86	39	314
2021 January	16	3	6	1	26	3	1	12	6	4	26
February	14	3	5	1	24	2	1	11	6	3	24
March	16	3	7	1	27	3	1	12	8	3	27
April	15	3	6	1	26	3	1	12	7	3	26
May	16	3	7	1	28	3	1	12	8	3	28
June	15	3	7	1	27	3	1	12	8	3	27
July	16	3	7	1	28	3	1	12	8	4	28
August	16	3	7	1	28	3	1	12	8	3	28
September	15	3	7	1	26	3	1	12	8	3	26
October	15	3	7	1	27	3	1	12	8	3	27
November	15	3	7	1	26	3	1	12	8	3	26
December	16	3	7	1	28	3	1	12	8	3	28
Total	187	39	79	16	321	32	13	144	92	39	321
2022 January	16	3	6	1	27	3	1	12	7	3	27
February	15	3	6	1	25	3	1	11	7	3	25
March	16	3	7	1	27	3	1	12	8	3	27
April	15	3	6	1	26	3	1	12	R 7	3	26
May	16	3	7	1	27	3	1	12	8	3	27
June	16	3	7	1	27	3	1	12	8	3	27
July	16	3	7	1	28	3	1	12	8	3	28
August	16	3	7	1	28	3	1	12	8	3	28
September	15	3	6	1	26	3	1	11	7	3	26
October	15	3	7	1	27	3	1	11	8	3	27
November	15	3	7	1	27	3	1	11	8	3	27
December	16	3	7	1	27	3	1	12	8	3	27
Total	189	37	80	16	321	40	R 17	139	92	35	321
2023 January	16	3	7	1	27	4	1	12	8	3	27
February	14	3	6	1	24	3	1	11	7	3	24
March	16	3	7	1	27	4	1	11	8	3	27
April	14	3	6	1	25	3	1	10	R 7	2	25
May	15	3	7	2	27	4	1	11	8	3	27
June	15	3	7	2	26	3	1	10	8	3	26
July	15	3	7	2	27	4	1	11	8	3	27
August	15	3	7	2	27	4	1	11	R 8	3	27
September	14	3	7	2	25	3	1	10	8	2	25
October	14	3	7	2	26	4	1	11	8	2	26
November	15	3	7	2	26	3	1	11	8	2	26
December	15	3	7	1	27	4	1	11	8	2	27
Total	180	36	81	18	315	42	16	131	95	30	315

^a Metric tons of carbon dioxide can be converted to metric tons of carbon equivalent by multiplying by 12/44.
^b Wood and wood-derived fuels.
^c Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.
^d Fuel ethanol minus denaturant.
^e Commercial sector, including commercial combined-heat-and-power (CHP) and commercial electricity-only plants.
^f Industrial sector, including industrial combined-heat-and-power (CHP) and industrial electricity-only plants.
^g 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.

R=Revised. 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 11.1–11.6. See Note 2, "Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion," at end of section. • Data are estimates. See "Section 11 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.

Note 1. Emissions of Carbon Dioxide and Other Greenhouse Gases. Greenhouse gases are those gases—such as water vapor, carbon dioxide (CO₂), 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.

The vast majority of U.S. CO₂ 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 CO₂ 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 11.1–11.6 are estimates for U.S. CO₂ emissions from energy consumption, plus the non-combustion use of fossil fuels (excluded are estimates for CO₂ emissions from biomass energy consumption, which appear in MER Table 11.7).

For annual U.S. estimates of CO₂ emissions from all sources, as well as emissions for other greenhouse gases, see the U.S. Environmental Protection Agency's *Inventory of U.S. Greenhouse Gas Emissions and Sinks* reports at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020>.

Note 2. Accounting for Carbon Dioxide Emissions From Biomass Energy Combustion. Carbon dioxide (CO₂) emissions from the combustion of biomass to produce energy are excluded from the energy-related CO₂ emissions reported in MER Tables 11.1–11.6, but appear in MER Table 11.7. 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 CO₂ emissions from biomass can potentially lead to confusion in accounting for and understanding the flow of CO₂ emissions within energy and non-energy systems. In recognition of this issue, reporting of CO₂ emissions from biomass combustion alongside other energy-related CO₂ 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 CO₂ emissions from biomass and energy-related CO₂ 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 11 Methodology and Sources

To estimate carbon dioxide emissions from energy consumption for the *Monthly Energy Review* (MER), Tables 11.1–11.7, 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 [through 2021]) 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 [through 2021], 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 and renewable diesel fuel, which are non-fossil renewable fuels.

2009–2011: To remove the biodiesel portion from distillate fuel oil, data for biodiesel consumption (calculated using data from EIA, EIA-22M, "Monthly Biodiesel Production Survey") and biomass-based diesel fuel data (from EIA-810, "Monthly Refinery Report," EIA-812, "Monthly Product Pipeline Report," and EIA-815, "Monthly Bulk Terminal and Blender Report") 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. To remove the renewable diesel fuel portion from distillate fuel oil, data for refinery and blender net inputs (from EIA-810, "Monthly Refinery Report," and EIA-815, "Monthly Bulk Terminal and Blender Report") are converted to trillion Btu by multiplying by the renewable diesel fuel heat content factor in MER Table A1, and then subtracted from the distillate fuel oil consumption values.

2012–2020: To remove the biodiesel portion from distillate fuel oil, data for biodiesel consumption (from MER Table 10.4) is subtracted from the distillate fuel oil consumption values. To remove the renewable diesel fuel portion from distillate fuel oil, data for refinery and blender net inputs (from EIA-810, "Monthly Refinery Report," and EIA-815, "Monthly Bulk Terminal and Blender Report") are converted to trillion Btu by multiplying by the renewable diesel fuel heat content factor in MER Table A1, and then subtracted from the distillate fuel oil consumption values.

2021 forward: To remove the biodiesel and renewable diesel fuel portions from distillate fuel oil, data for refinery and blender net inputs (from EIA-810, "Monthly Refinery Report," and EIA-815, "Monthly Bulk Terminal and Blender Report") are converted to trillion Btu by multiplying by the biodiesel and renewable diesel fuel heat content factors 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 11, 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 11, 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, other oils, petroleum coke, residual fuel oil, special naphthas, still gas, waxes, and miscellaneous petroleum products. See Tables 1.12a and 1.12b for estimates of fossil fuel non-combustion uses.

In the non-combustion use of these fuels, some of the carbon is stored (sequestered) in the final product, and EIA subtracts this from the fuel consumption values in Steps 1 and 2. EIA calculates the amount of carbon sequestered as the product of the non-combustion use of fossil fuels shown in MER Table 1.12b and the following carbon sequestration factors. The factors range from 0.00 to 1.00. A factor of 0.00 indicates that the fuel does not sequester any carbon (all is emitted), while a factor of 1.00 indicates that the fuel sequesters all of the carbon (none is emitted). EIA uses the following carbon sequestration factors: coal—0.75; natural gas used to produce hydrogen—0.00; natural gas used for other manufacturing—0.44; asphalt and road oil—1.00; distillate fuel oil—0.50; hydrocarbon gas liquids—0.80; lubricants—0.50; naphthas used for petrochemical feedstock—0.75; other oils used for petrochemical feedstock—0.50; petroleum coke used for aluminum production—0.00; petroleum coke used for other manufacturing—0.50; residual fuel oil—0.50; special naphthas—0.00; still gas—0.80; waxes—1.00; and miscellaneous petroleum products—1.00.

Step 4. Determine Carbon Dioxide Emissions From Energy Consumption

EIA calculates carbon dioxide (CO₂) emissions data in million metric tons as the product of the consumption values in trillion Btu from Steps 1 and 2 (minus the carbon sequestered by non-combustion use in Step 3) and the annual CO₂ emissions factors at https://www.eia.gov/environment/emissions/xls/CO2_coefs_detailed.xls.

Except for plant condensate and unfractionated stream (which are EIA estimates), the CO₂ emissions factors for fossil fuels are from the U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, Tables A-22, A-34, and A-230. EIA converts metric tons of carbon to metric tons of CO₂ using the approximate molar mass (44/12)—see <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021>.

Coal—EIA calculates coal CO₂ emissions 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—EIA calculates coal coke net imports CO₂ emissions for the industrial sector.

Natural Gas—EIA calculates natural gas CO₂ emissions for each sector (residential, commercial, industrial, transportation, electric power). Total natural gas emissions are the sum of the sectoral natural gas emissions.

Petroleum—EIA calculates CO₂ emissions for each petroleum product and sector. 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). EIA estimates residential, commercial, and transportation sector HGL emissions as the product of the HGL consumption values in trillion Btu from MER Tables 3.8a and 3.8c and the propane emissions factor. EIA estimates industrial sector HGL emissions as total HGL emissions minus emissions by the other sectors.

Geothermal and Non-Biomass Waste—EIA estimates annual CO₂ emissions data for geothermal and non-biomass waste on Form EIA-923, "Power Plant Operations Report" (and predecessor forms). EIA estimates monthly data 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—EIA calculates wood, biomass waste, and biofuel CO₂ emissions for each sector. Total emissions for each biomass fuel are the sum of the sectoral emissions. EIA uses the following CO₂ emissions factors, in million metric tons CO₂ per quadrillion Btu: wood—93.80; biomass waste—90.70; fuel ethanol—68.44; and biodiesel—73.84. For 1973–1988, EIA estimates the biomass portion of waste in MER Tables 10.2a–10.2c as 67%; for 1989–2000, the annual biomass portion of waste ranges from 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 <https://www.eia.gov/totalenergy/data/monthly/pdf/historical/msw.pdf>.

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