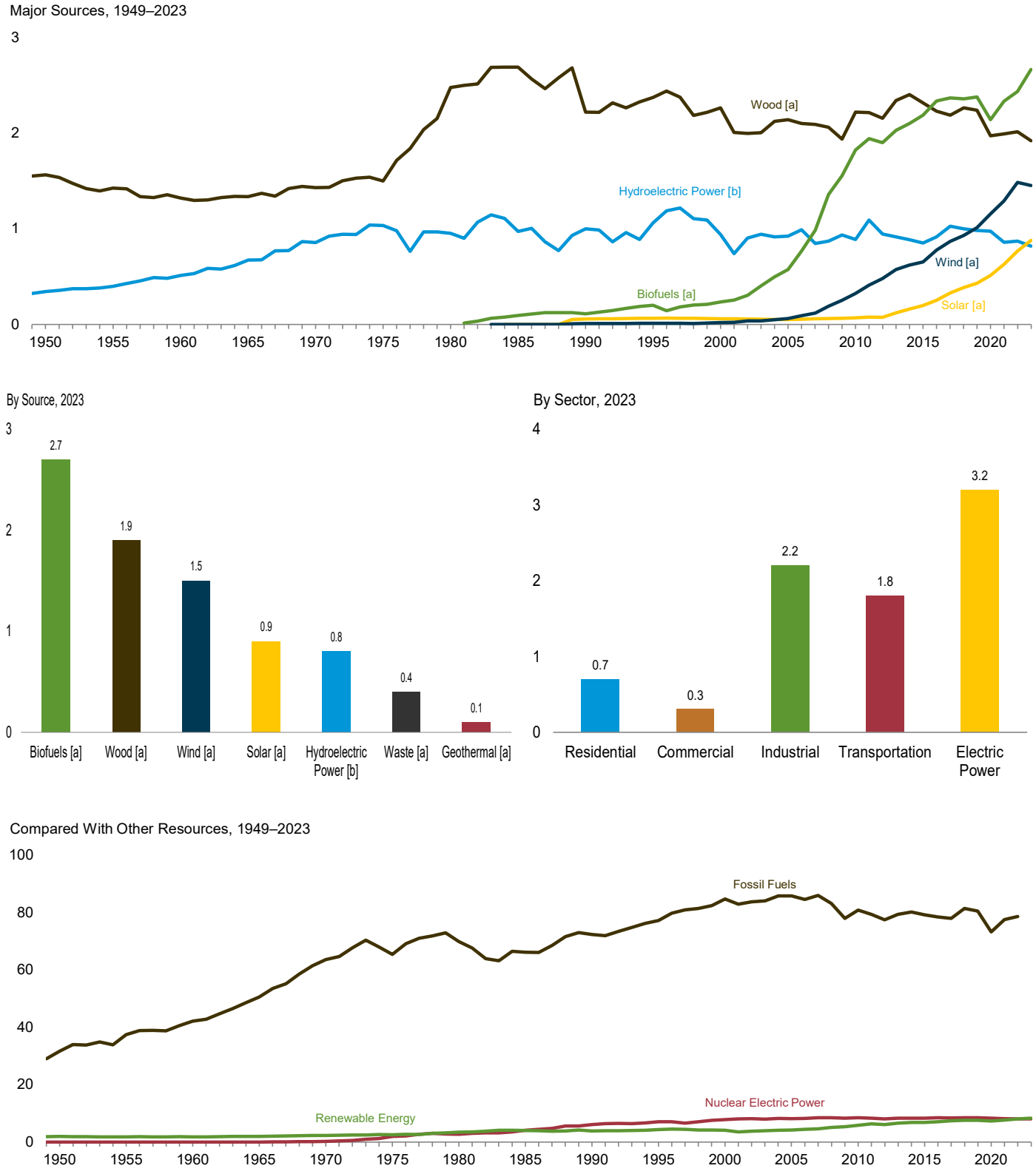
10. Renewable Energy

Figure 10.1 Renewable Energy Consumption

(Quadrillion Btu)



[a] See Table 10.1 for definition.
[b] Conventional hydroelectric power.

Web Page: http://www.eia.gov/totalenergy/data/monthly/#renewable.
Sources: Tables 1.3 and 10.1–10.2c.

Table 10.1 Renewable Energy Production and Consumption by Source

(Trillion Btu)

	Production[a]				Consumption								
	Biomass			Total Renewable Energy	Hydroelectric Power[f]	Geothermal[g]	Solar[h]	Wind[i]	Biomass				Total Renewable Energy
	Wood[b]	Biofuels[c]	Total[d]						Wood[j]	Waste[k]	Biofuels[l]	Total	
1950 Total	**1,562**	**NA**	**1,562**	**1,907**	**344**	**NA**	**NA**	**NA**	**1,562**	**NA**	**NA**	**1,562**	**1,907**
1955 Total	**1,424**	**NA**	**1,424**	**1,821**	**397**	**NA**	**NA**	**NA**	**1,424**	**NA**	**NA**	**1,424**	**1,821**
1960 Total	**1,320**	**NA**	**1,320**	**1,830**	**510**	**(s)**	**NA**	**NA**	**1,320**	**NA**	**NA**	**1,320**	**1,830**
1965 Total	**1,335**	**NA**	**1,335**	**2,008**	**672**	**1**	**NA**	**NA**	**1,335**	**NA**	**NA**	**1,335**	**2,008**
1970 Total	**1,429**	**NA**	**1,431**	**2,289**	**856**	**2**	**NA**	**NA**	**1,429**	**2**	**NA**	**1,431**	**2,289**
1975 Total	**1,497**	**NA**	**1,499**	**2,544**	**1,034**	**11**	**NA**	**NA**	**1,497**	**2**	**NA**	**1,499**	**2,544**
1980 Total	**2,474**	**NA**	**2,475**	**3,445**	**953**	**17**	**NA**	**NA**	**2,474**	**2**	**NA**	**2,475**	**3,445**
1985 Total	**2,687**	**93**	**3,016**	**4,018**	**970**	**32**	**(s)**	**(s)**	**2,687**	**236**	**93**	**3,016**	**4,018**
1990 Total	**2,216**	**111**	**2,735**	**3,863**	**999**	**63**	**56**	**10**	**2,216**	**408**	**111**	**2,735**	**3,863**
1995 Total	**2,370**	**198**	**3,099**	**4,295**	**1,061**	**60**	**64**	**11**	**2,370**	**531**	**200**	**3,101**	**4,297**
2000 Total	**2,262**	**233**	**3,006**	**4,093**	**940**	**69**	**59**	**19**	**2,262**	**511**	**236**	**3,008**	**4,096**
2005 Total	**2,137**	**561**	**3,101**	**4,220**	**922**	**84**	**52**	**61**	**2,137**	**403**	**574**	**3,114**	**4,233**
2006 Total	**2,099**	**716**	**3,212**	**4,430**	**987**	**86**	**54**	**91**	**2,099**	**397**	**766**	**3,262**	**4,480**
2007 Total	**2,089**	**970**	**3,472**	**4,582**	**845**	**91**	**57**	**118**	**2,089**	**413**	**983**	**3,485**	**4,595**
2008 Total	**2,059**	**1,374**	**3,868**	**5,085**	**869**	**97**	**61**	**189**	**2,059**	**435**	**1,357**	**3,851**	**5,068**
2009 Total	**1,935**	**1,570**	**3,957**	**5,309**	**933**	**105**	**63**	**252**	**1,935**	**452**	**1,553**	**3,940**	**5,293**
2010 Total	**2,217**	**1,868**	**4,553**	**5,943**	**888**	**111**	**68**	**323**	**2,217**	**468**	**1,821**	**4,506**	**5,896**
2011 Total	**2,213**	**2,037**	**4,712**	**6,404**	**1,090**	**116**	**76**	**410**	**2,213**	**462**	**1,941**	**4,616**	**6,308**
2012 Total	**2,151**	**1,936**	**4,554**	**6,187**	**943**	**117**	**94**	**480**	**2,151**	**467**	**1,899**	**4,517**	**6,150**
2013 Total	**2,338**	**2,000**	**4,835**	**6,561**	**916**	**117**	**120**	**573**	**2,338**	**496**	**2,026**	**4,861**	**6,587**
2014 Total	**2,401**	**2,135**	**5,052**	**6,836**	**885**	**118**	**161**	**620**	**2,401**	**516**	**2,099**	**5,016**	**6,799**
2015 Total	**2,312**	**2,201**	**5,031**	**6,846**	**850**	**118**	**196**	**651**	**2,312**	**518**	**2,185**	**5,015**	**6,829**
2016 Total	**2,299**	**2,329**	**5,132**	**7,188**	**914**	**117**	**251**	**774**	**2,227**	**503**	**2,333**	**5,063**	**7,120**
2017 Total	**2,264**	**2,407**	**5,166**	**7,505**	**1,025**	**118**	**329**	**868**	**2,185**	**495**	**2,364**	**5,045**	**7,383**
2018 Total	**2,356**	**2,471**	**5,314**	**7,744**	**998**	**118**	**384**	**930**	**2,262**	**487**	**2,355**	**5,105**	**7,535**
2019 Total	**2,341**	**2,432**	**5,215**	**7,753**	**982**	**116**	**430**	**1,010**	**2,237**	**442**	**2,376**	**5,056**	**7,594**
2020 Total	**2,076**	**2,194**	**4,710**	**7,465**	**973**	**118**	**511**	**1,153**	**1,970**	**440**	**2,136**	**4,545**	**7,301**
2021 January	180	191	409	637	84	10	32	103	172	38	169	379	607
February	162	152	348	553	69	9	36	91	154	34	154	342	547
March	179	194	411	678	72	10	51	134	167	38	194	399	667
April	171	187	393	651	66	10	59	123	162	36	186	383	642
May	176	206	418	690	80	10	67	115	168	36	207	410	682
June	175	201	410	657	80	10	66	91	164	34	200	398	645
July	181	209	426	651	75	10	66	74	173	36	204	413	639
August	182	195	413	649	69	10	64	92	172	35	200	407	643
September	175	185	395	621	58	10	59	99	164	34	186	385	611
October	172	214	422	650	58	10	50	110	164	35	214	413	641
November	173	216	424	664	66	10	42	122	161	35	207	403	643
December	183	224	445	707	80	10	35	136	171	38	209	418	680
Total	**2,109**	**2,374**	**4,914**	**7,807**	**858**	**118**	**627**	**1,290**	**1,989**	**430**	**2,331**	**4,751**	**7,644**
2022 January	184	214	435	698	83	10	42	128	175	37	193	404	666
February	171	190	394	652	73	9	47	128	159	33	177	370	628
March	181	212	430	733	83	10	63	147	169	37	207	412	715
April	173	198	406	712	68	10	71	158	164	34	195	393	700
May	182	214	430	743	80	10	79	144	170	35	208	412	725
June	182	214	430	726	89	10	83	115	168	33	213	414	710
July	185	218	436	713	84	10	83	101	175	34	206	415	692
August	184	211	429	672	72	10	77	84	174	34	213	421	664
September	177	193	402	633	58	10	70	93	162	32	192	387	618
October	174	217	425	659	49	10	63	112	163	34	216	413	647
November	174	219	427	686	61	10	47	141	164	34	209	407	665
December	183	211	429	680	70	10	40	132	169	35	205	409	661
Total	**2,150**	**2,511**	**5,073**	**8,307**	**869**	**118**	**765**	**1,482**	**2,012**	**412**	**2,433**	**4,857**	**8,091**
2023 January	R 182	220	437	702	76	11	44	134	174	36	210	420	685
February	162	198	393	660	64	9	51	144	154	32	190	376	R 644
March	180	222	436	735	69	10	67	152	165	34	220	420	R 719
April	160	212	404	700	60	10	79	147	152	32	207	391	687
May	R 175	229	438	741	94	10	90	109	R 164	34	234	432	735
June	168	230	430	692	66	10	92	94	156	32	232	R 420	R 682
July	172	232	437	712	72	10	R 98	95	162	33	223	418	693
August	177	230	440	712	72	10	93	97	163	33	235	431	703
September	166	227	425	R 669	56	10	82	96	153	32	224	408	652
October	166	231	430	R 701	62	10	74	124	154	33	233	420	690
November	R 168	229	R 430	R 684	62	10	56	126	159	32	219	410	664
December	173	248	456	714	66	10	51	131	162	36	235	432	690
Total	**2,049**	**2,708**	**5,155**	**8,422**	**818**	**120**	**878**	**1,451**	**1,918**	**398**	**2,662**	**4,978**	**8,245**

[a] For hydroelectric power, geothermal, solar, wind, and biomass waste, production equals consumption.

[b] Wood and wood-derived fuels. Through 2015, wood production equals consumption. Beginning in 2016, wood production equals consumption plus densified biomass exports.

[c] Total biomass inputs to the production of fuel ethanol and biodiesel. Beginning in 2011, also includes production of renewable diesel fuel. Beginning in 2014, also includes production of other biofuels.

[d] Includes biomass waste.

[e] Hydroelectric power, geothermal, solar, wind, and biomass.

[f] Conventional hydroelectricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[g] Geothermal electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6), and geothermal heat pump and direct use energy.

[h] Solar photovoltaic (PV) and solar thermal electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6), and solar thermal direct use energy.

[i] Wind electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[j] Wood and wood-derived fuels.

[k] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

[l] Fuel ethanol (minus denaturant), biodiesel, renewable diesel fuel, and other biofuels consumption; plus losses and co-products from the production of fuel ethanol and biodiesel.

R=Revised. NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • Production data are estimates. Consumption data are estimates, except for hydroelectric power in 1949–1978 and 1989 forward, and wind. • See Note, "Renewable Energy Production and Consumption," 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/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: • **Production:** Tables 10.2a–10.4c and U.S. Energy Information Administration, Form EIA-63C, "Densified Biomass Fuel Report." • **Consumption:** Tables 10.2a–10.2c.

Table 10.2a Renewable Energy Consumption: Residential and Commercial Sectors

(Trillion Btu)

	Residential Sector				Commercial Sector[a]								
			Biomass						Biomass				
	Geo-thermal[b]	Solar[c]	Wood[d]	Total	Hydro-electric Power[e]	Geo-thermal[f]	Solar[g]	Wind[h]	Wood[d]	Waste[i]	Fuel Ethanol[j,k]	Total	Total
1950 Total	NA	NA	1,006	1,006	NA	NA	NA	NA	19	NA	NA	19	19
1955 Total	NA	NA	775	775	NA	NA	NA	NA	15	NA	NA	15	15
1960 Total	NA	NA	627	627	NA	NA	NA	NA	12	NA	NA	12	12
1965 Total	NA	NA	468	468	NA	NA	NA	NA	9	NA	NA	9	9
1970 Total	NA	NA	401	401	NA	NA	NA	NA	8	NA	NA	8	8
1975 Total	NA	NA	425	425	NA	NA	NA	NA	8	NA	NA	8	8
1980 Total	NA	NA	850	850	NA	NA	NA	NA	21	NA	NA	21	21
1985 Total	NA	NA	1,010	1,010	NA	NA	NA	NA	24	NA	(s)	24	24
1990 Total	6	55	580	640	(s)	3	(s)	–	66	28	(s)	94	97
1995 Total	7	63	520	589	(s)	5	(s)	–	72	40	(s)	113	118
2000 Total	9	57	420	486	(s)	8	(s)	–	71	47	(s)	119	127
2005 Total	16	49	430	495	(s)	14	1	–	70	34	1	105	120
2006 Total	18	51	380	450	(s)	14	1	–	65	36	1	103	118
2007 Total	22	53	420	495	(s)	14	1	–	70	31	2	103	119
2008 Total	26	56	470	552	(s)	15	2	–	73	34	2	109	126
2009 Total	33	56	504	593	(s)	17	3	(s)	73	36	3	112	131
2010 Total	37	59	541	636	(s)	19	4	(s)	72	36	3	111	134
2011 Total	40	62	524	626	(s)	20	7	(s)	69	43	3	115	141
2012 Total	40	66	438	544	(s)	20	11	(s)	61	45	3	108	139
2013 Total	40	72	572	683	(s)	20	15	(s)	70	47	3	120	155
2014 Total	40	79	579	697	(s)	20	19	(s)	76	47	4	127	166
2015 Total	40	87	513	639	(s)	20	21	(s)	79	47	[k] 26	152	193
2016 Total	40	100	445	584	1	20	23	(s)	84	48	26	158	201
2017 Total	40	113	430	582	1	20	28	(s)	84	48	25	156	205
2018 Total	40	123	525	688	1	20	35	1	84	47	25	156	213
2019 Total	40	136	546	721	1	21	40	1	84	39	26	149	211
2020 Total	40	151	345	536	1	21	46	1	83	38	26	147	215
2021 January	3	9	29	42	(s)	2	3	(s)	7	3	2	12	17
February	3	10	26	39	(s)	2	3	(s)	6	3	2	11	16
March	3	14	29	47	(s)	2	5	(s)	7	3	2	13	19
April	3	16	28	47	(s)	2	5	(s)	7	3	2	12	19
May	3	17	29	50	(s)	2	5	(s)	7	3	2	12	20
June	3	18	28	49	(s)	2	6	(s)	7	3	2	12	20
July	3	18	29	50	(s)	2	6	(s)	7	4	2	13	21
August	3	17	29	49	(s)	2	5	(s)	7	3	2	13	20
September	3	15	28	46	(s)	2	5	(s)	7	3	2	12	19
October	3	13	29	46	(s)	2	4	(s)	7	3	2	13	19
November	3	11	28	43	(s)	2	3	(s)	7	3	2	12	18
December	3	10	29	43	(s)	2	3	(s)	7	3	2	13	18
Total	40	169	344	553	1	21	54	1	83	39	27	149	225
2022 January	3	11	36	50	(s)	2	4	(s)	7	6	2	[R] 16	21
February	3	12	32	47	(s)	2	4	(s)	6	6	2	[R] 15	20
March	3	17	36	56	(s)	2	5	(s)	7	6	[R] 3	[R] 16	23
April	3	18	35	56	(s)	2	6	(s)	7	6	[R] 3	15	23
May	3	20	36	60	(s)	2	6	(s)	7	6	[R] 3	16	24
June	3	20	35	58	(s)	2	6	(s)	7	6	[R] 3	16	24
July	3	21	36	60	(s)	2	7	(s)	7	7	[R] 3	16	[R] 25
August	3	20	36	59	(s)	2	6	(s)	7	6	[R] 3	16	[R] 25
September	3	18	35	56	(s)	2	6	(s)	7	6	[R] 3	15	23
October	3	17	36	56	(s)	2	5	(s)	7	6	[R] 3	16	[R] 23
November	3	13	35	51	(s)	2	4	(s)	7	6	[R] 3	[R] 16	21
December	3	12	36	52	(s)	2	4	(s)	7	6	[R] 3	[R] 16	21
Total	40	200	422	662	1	20	63	1	83	75	[R] 32	[R] 190	[R] 274
2023 January	3	13	38	54	(s)	2	4	(s)	7	6	[R] 3	[R] 16	21
February	3	14	35	51	(s)	2	4	(s)	6	5	2	14	20
March	3	19	38	61	NM	2	6	(s)	7	6	[R] 3	15	23
April	3	21	37	62	NM	2	6	(s)	7	6	[R] 3	[R] 15	23
May	3	24	38	66	NM	2	7	(s)	7	6	[R] 3	15	24
June	3	24	37	64	NM	2	7	(s)	7	6	[R] 3	15	24
July	3	[R] 25	38	66	NM	2	7	(s)	7	6	[R] 3	[R] 16	25
August	3	24	38	66	NM	2	7	(s)	7	6	[R] 3	16	[R] 25
September	3	21	37	61	NM	2	6	(s)	7	6	[R] 3	15	23
October	3	20	38	61	NM	2	5	(s)	7	6	[R] 3	[R] 16	[R] 23
November	3	16	37	56	(s)	2	4	(s)	7	6	[R] 3	15	21
December	3	15	38	56	NM	2	4	(s)	7	6	3	16	22
Total	40	235	450	725	1	20	69	1	82	71	32	185	275

[a] Commercial sector, including commercial combined-heat-and-power (CHP) and commercial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[b] Geothermal heat pump and direct use energy.

[c] Small-scale solar photovoltaic (PV) electricity generation in the residential sector (converted to Btu by multiplying by the heat content of electricity in Table A6) and small-scale solar thermal energy in the residential, commercial, and industrial sectors. See Table 10.5.

[d] Wood and wood-derived fuels.

[e] Conventional hydroelectricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[f] Geothermal heat pump and direct use energy. Beginning in December 2018, also includes geothermal electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[g] Solar photovoltaic (PV) electricity net generation in the commercial sector (converted to Btu by multiplying by the heat content of electricity in Table A6), both utility-scale and small-scale. See Table 10.5.

[h] Wind electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[i] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

[j] The fuel ethanol (minus denaturant) portion of motor fuels, such as E10, consumed by the commercial sector.

[k] There is a discontinuity in this time series between 2014 and 2015 due to a change in the method for allocating motor gasoline consumption to the end-use sectors. Beginning in 2015, the commercial and industrial sector shares of fuel ethanol consumption are larger than in 2014, while the transportation sector share is smaller.

R=Revised. NA=Not available. NM=Not meaningful. – =No data reported. (s)=Less than 0.5 trillion Btu.

Notes: • Residential sector data are estimates. Commercial sector data are estimates, except for hydroelectric power, wind, and biomass waste. • 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/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: See end of section.

Table 10.2b Renewable Energy Consumption: Industrial Sector

(Trillion Btu)

	Industrial Sector[a]									
					Biomass					
	Hydro-electric Power[b]	Geo-thermal[c]	Solar[d]	Wind[e]	Wood[f]	Waste[g]	Fuel Ethanol[h,i]	Losses and Co-products[j]	Total	Total
1950 Total	**17**	**NA**	**NA**	**NA**	**532**	**NA**	**NA**	**NA**	**532**	**549**
1955 Total	**11**	**NA**	**NA**	**NA**	**631**	**NA**	**NA**	**NA**	**631**	**642**
1960 Total	**12**	**NA**	**NA**	**NA**	**680**	**NA**	**NA**	**NA**	**680**	**692**
1965 Total	**11**	**NA**	**NA**	**NA**	**855**	**NA**	**NA**	**NA**	**855**	**866**
1970 Total	**11**	**NA**	**NA**	**NA**	**1,019**	**NA**	**NA**	**NA**	**1,019**	**1,030**
1975 Total	**11**	**NA**	**NA**	**NA**	**1,063**	**NA**	**NA**	**NA**	**1,063**	**1,074**
1980 Total	**11**	**NA**	**NA**	**NA**	**1,600**	**NA**	**NA**	**NA**	**1,600**	**1,611**
1985 Total	**11**	**NA**	**NA**	**NA**	**1,645**	**230**	**1**	**42**	**1,918**	**1,928**
1990 Total	**10**	**2**	**(s)**	**–**	**1,442**	**192**	**1**	**49**	**1,684**	**1,696**
1995 Total	**18**	**3**	**(s)**	**–**	**1,652**	**195**	**2**	**86**	**1,934**	**1,955**
2000 Total	**14**	**4**	**(s)**	**–**	**1,636**	**145**	**1**	**99**	**1,881**	**1,900**
2005 Total	**11**	**4**	**(s)**	**–**	**1,452**	**148**	**7**	**227**	**1,834**	**1,849**
2006 Total	**10**	**4**	**(s)**	**–**	**1,472**	**130**	**10**	**280**	**1,892**	**1,906**
2007 Total	**5**	**5**	**(s)**	**–**	**1,413**	**145**	**10**	**369**	**1,937**	**1,947**
2008 Total	**6**	**5**	**(s)**	**–**	**1,339**	**143**	**12**	**519**	**2,012**	**2,023**
2009 Total	**6**	**4**	**1**	**–**	**1,178**	**154**	**13**	**603**	**1,948**	**1,959**
2010 Total	**6**	**4**	**1**	**–**	**1,409**	**168**	**17**	**727**	**2,320**	**2,331**
2011 Total	**6**	**4**	**1**	**(s)**	**1,438**	**165**	**17**	**756**	**2,375**	**2,387**
2012 Total	**8**	**4**	**2**	**(s)**	**1,462**	**159**	**17**	**711**	**2,349**	**2,363**
2013 Total	**12**	**4**	**3**	**(s)**	**1,489**	**187**	**18**	**714**	**2,407**	**2,427**
2014 Total	**4**	**4**	**4**	**(s)**	**1,495**	**190**	**14**	**766**	**2,466**	**2,478**
2015 Total	**5**	**4**	**5**	**(s)**	**1,476**	**190**	**[i] 18**	**791**	**2,474**	**2,489**
2016 Total	**4**	**4**	**7**	**(s)**	**1,474**	**174**	**18**	**821**	**2,487**	**2,503**
2017 Total	**5**	**4**	**8**	**(s)**	**1,442**	**168**	**18**	**847**	**2,475**	**2,493**
2018 Total	**4**	**4**	**9**	**(s)**	**1,432**	**165**	**19**	**855**	**2,471**	**2,489**
2019 Total	**4**	**4**	**11**	**(s)**	**1,407**	**156**	**19**	**835**	**2,416**	**2,435**
2020 Total	**3**	**4**	**12**	**2**	**1,356**	**160**	**19**	**735**	**2,270**	**2,292**
2021 January	(s)	(s)	1	(s)	117	15	1	64	197	198
February	(s)	(s)	1	(s)	104	13	1	51	168	170
March	(s)	(s)	1	(s)	115	14	2	65	195	197
April	(s)	(s)	1	(s)	113	13	1	62	191	192
May	(s)	(s)	1	(s)	117	14	2	69	201	203
June	(s)	(s)	1	(s)	112	12	2	68	194	196
July	(s)	(s)	1	(s)	118	13	2	69	202	204
August	(s)	(s)	1	(s)	116	13	2	64	195	197
September	(s)	(s)	1	(s)	113	13	2	62	189	191
October	(s)	(s)	1	(s)	113	14	2	71	200	202
November	(s)	(s)	1	(s)	110	14	2	71	197	199
December	(s)	(s)	1	(s)	117	15	2	73	207	208
Total	**3**	**4**	**14**	**(s)**	**1,366**	**161**	**19**	**789**	**2,336**	**2,357**
2022 January	(s)	(s)	1	(s)	114	14	[R] 2	71	201	202
February	(s)	(s)	1	(s)	103	13	1	62	180	182
March	(s)	(s)	1	(s)	110	15	2	70	196	198
April	(s)	(s)	1	(s)	109	14	2	64	188	190
May	(s)	(s)	2	(s)	112	14	2	69	196	199
June	(s)	(s)	2	(s)	110	12	2	69	193	195
July	(s)	(s)	2	(s)	114	12	2	70	[R] 198	200
August	(s)	(s)	2	(s)	112	13	2	68	194	196
September	(s)	(s)	1	(s)	105	12	2	60	178	180
October	(s)	(s)	1	(s)	105	14	2	70	190	192
November	(s)	(s)	1	(s)	107	14	2	70	192	193
December	(s)	(s)	1	(s)	109	14	2	66	191	193
Total	**3**	**4**	**15**	**(s)**	**1,308**	**161**	**[R] 20**	**808**	**[R] 2,297**	**[R] 2,320**
2023 January	(s)	(s)	1	(s)	112	[R] 14	2	69	197	199
February	(s)	(s)	1	(s)	100	13	1	62	176	178
March	(s)	(s)	1	(s)	106	14	2	68	190	192
April	(s)	(s)	2	(s)	97	[R] 13	2	65	177	179
May	(s)	(s)	2	(s)	[R] 105	14	2	69	189	191
June	(s)	(s)	2	(s)	98	12	2	69	181	183
July	(s)	(s)	2	(s)	101	[R] 12	2	71	186	188
August	(s)	(s)	2	(s)	102	12	2	69	185	187
September	(s)	(s)	1	(s)	96	12	2	67	177	179
October	(s)	(s)	1	(s)	99	14	2	70	185	187
November	(s)	(s)	1	(s)	104	13	2	70	188	190
December	(s)	(s)	1	(s)	105	14	2	74	195	196
Total	**3**	**4**	**16**	**(s)**	**1,224**	**160**	**20**	**821**	**2,225**	**2,249**

[a] Industrial sector, including industrial combined-heat-and-power (CHP) and industrial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[b] Conventional hydroelectricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[c] Geothermal heat pump and direct use energy.

[d] Solar photovoltaic (PV) electricity net generation in the industrial sector (converted to Btu by multiplying by the heat content of electricity in Table A6), both utility-scale and small-scale. See Table 10.5.

[e] Wind electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[f] Wood and wood-derived fuels.

[g] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

[h] The fuel ethanol (minus denaturant) portion of motor fuels, such as E10, consumed by the industrial sector.

[i] There is a discontinuity in this time series between 2014 and 2015 due to a change in the method for allocating motor gasoline consumption to the end-use sectors. Beginning in 2015, the commercial and industrial sector shares of fuel ethanol consumption are larger than in 2014, while the transportation sector share is smaller.

[j] Losses and co-products from the production of fuel ethanol and biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol and biodiesel—these are included in the industrial sector consumption statistics for the appropriate energy source.

R=Revised. NA=Not available. – =No data reported. (s)=Less than 0.5 trillion Btu.

Notes: • Industrial sector data are estimates, except for hydroelectric power in 1949–1978 and 1989 forward, and wind. • 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/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: See end of section.

Table 10.2c Renewable Energy Consumption: Transportation and Electric Power Sectors

(Trillion Btu)

	Transportation Sector					Electric Power Sector[a]							
	Biomass									Biomass			
	Fuel Ethanol[b,c]	Biodiesel[d]	Renewable Diesel Fuel[e]	Other Biofuels[f]	Total	Hydroelectric Power[g]	Geothermal[h]	Solar[i]	Wind[j]	Wood[k]	Waste[l]	Total	Total
1950 Total	NA	NA	NA	NA	NA	327	NA	NA	NA	5	NA	5	333
1955 Total	NA	NA	NA	NA	NA	385	NA	NA	NA	3	NA	3	389
1960 Total	NA	NA	NA	NA	NA	498	(s)	NA	NA	2	NA	2	499
1965 Total	NA	NA	NA	NA	NA	661	1	NA	NA	3	NA	3	665
1970 Total	NA	NA	NA	NA	NA	845	2	NA	NA	1	2	4	851
1975 Total	NA	NA	NA	NA	NA	1,024	11	NA	NA	(s)	2	2	1,037
1980 Total	NA	NA	NA	NA	NA	942	17	NA	NA	3	2	4	964
1985 Total	50	NA	NA	NA	50	959	32	(s)	(s)	8	7	14	1,006
1990 Total	60	NA	NA	NA	60	989	53	1	10	129	188	317	1,369
1995 Total	112	NA	NA	NA	112	1,042	46	2	11	125	296	422	1,522
2000 Total	135	NA	NA	NA	135	926	48	2	19	134	318	453	1,447
2005 Total	327	12	NA	NA	339	911	50	2	61	185	221	406	1,430
2006 Total	442	33	NA	NA	475	977	50	2	91	182	231	412	1,531
2007 Total	557	45	NA	NA	602	839	50	2	118	186	237	423	1,432
2008 Total	786	39	NA	NA	825	864	51	3	189	177	258	435	1,541
2009 Total	894	41	NA	NA	935	926	51	3	252	180	261	441	1,674
2010 Total	1,041	33	NA	NA	1,075	882	52	4	323	196	264	459	1,720
2011 Total	1,045	113	8	NA	1,166	1,083	52	6	410	182	255	437	1,988
2012 Total	1,045	115	10	NA	1,169	934	53	14	480	190	262	453	1,935
2013 Total	1,072	182	39	NA	1,292	904	54	30	572	207	262	470	2,030
2014 Total	1,093	181	38	2	1,314	880	54	59	619	251	279	530	2,143
2015 Total	[c] 1,110	191	48	2	1,351	845	54	83	650	244	281	525	2,158
2016 Total	1,143	266	57	2	1,469	909	54	121	774	224	281	505	2,363
2017 Total	1,156	253	62	3	1,474	1,019	54	180	867	229	280	510	2,630
2018 Total	1,152	243	57	3	1,456	993	54	216	929	221	275	496	2,689
2019 Total	1,162	231	99	4	1,497	978	51	243	1,009	201	248	448	2,729
2020 Total	1,004	239	107	4	1,355	969	53	302	1,150	185	242	428	2,902
2021 January	78	13	10	(s)	102	83	4	19	102	18	20	38	247
February	74	17	10	1	101	68	4	21	91	17	18	35	220
March	93	19	12	1	125	72	4	32	134	16	20	37	278
April	88	19	13	1	120	66	4	37	123	13	19	32	263
May	99	20	14	1	134	79	4	42	115	15	20	34	275
June	97	17	13	1	128	80	4	41	91	17	19	36	252
July	100	19	11	1	131	75	4	41	74	19	19	38	233
August	97	19	15	1	132	69	4	41	92	19	19	38	244
September	92	18	11	1	120	58	4	38	99	16	19	35	234
October	101	19	17	1	139	58	4	31	110	14	18	33	236
November	96	18	16	1	132	66	5	26	122	15	18	34	252
December	95	19	16	1	132	80	5	21	136	17	20	37	278
Total	**1,110**	**218**	**158**	**10**	**1,496**	**854**	**53**	**391**	**1,289**	**197**	**229**	**426**	**3,014**
2022 January	87	14	16	1	118	82	5	27	128	18	16	34	275
February	81	15	14	1	112	72	4	31	128	17	15	32	267
March	96	18	18	1	133	83	4	40	147	16	16	32	306
April	90	19	17	2	128	68	4	45	157	14	14	28	303
May	97	17	18	2	135	79	5	51	144	15	14	29	308
June	97	19	22	2	140	88	4	54	115	17	15	31	294
July	94	18	18	2	132	84	5	53	101	19	15	34	276
August	100	18	21	3	141	72	5	49	84	19	15	33	243
September	90	17	19	2	129	58	5	45	93	16	14	30	231
October	98	19	22	3	142	49	4	40	112	14	14	29	234
November	95	20	18	2	135	61	5	28	140	15	14	30	264
December	93	17	22	3	135	69	5	23	132	17	15	32	261
Total	**1,117**	**212**	**225**	**25**	**1,579**	**865**	**55**	**487**	**1,481**	**198**	**176**	**374**	**3,263**
2023 January	92	18	25	3	138	76	5	27	134	16	15	31	273
February	83	17	24	2	125	63	4	31	[R] 144	[R] 13	14	27	270
March	97	20	28	3	149	69	5	41	152	14	14	29	295
April	91	18	28	2	139	59	5	50	147	11	13	24	285
May	98	23	38	3	162	93	5	57	109	14	14	28	293
June	98	23	35	3	159	66	4	60	94	15	13	28	252
July	95	21	29	3	149	72	4	64	95	16	14	30	266
August	101	22	37	2	162	72	5	60	97	16	14	[R] 30	[R] 264
September	92	23	34	4	153	56	5	53	96	13	14	27	236
October	100	22	33	4	158	61	5	48	124	10	13	23	262
November	94	21	26	3	145	61	5	35	126	[R] 12	13	24	[R] 252
December	94	20	38	4	157	66	5	31	131	12	15	27	260
Total	**1,134**	**247**	**375**	**37**	**1,794**	**814**	**56**	**558**	**1,450**	**162**	**167**	**329**	**3,207**

[a] 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. Through 1988, data are for electric utilities only; beginning in 1989, data are for electric utilities and independent power producers.

[b] The fuel ethanol (minus denaturant) portion of motor fuels, such as E10 and E85, consumed by the transportation sector.

[c] There is a discontinuity in this time series between 2014 and 2015 due to a change in the method for allocating motor gasoline consumption to the end-use sectors. Beginning in 2015, the commercial and industrial sector shares of fuel ethanol consumption are larger than in 2014, while the transportation sector share is smaller.

[d] "Biodiesel" is primarily fatty acid methyl esters (FAME). See "Biodiesel" in Glossary. Although there is use of biodiesel in other sectors, all consumption is assigned to the transportation sector.

[e] "Renewable diesel fuel," which is commonly called "non-ester renewable diesel" and "green diesel," is chemically similar to petroleum diesel fuel. Although there is use of renewable diesel fuel in other sectors, all consumption is assigned to the transportation sector.

[f] Renewable heating oil, renewable jet fuel (sustainable aviation fuel), renewable naphtha and gasoline, biobutanol, and other biofuels and biointermediates. Although there is use of these biofuels in other sectors, all consumption is assigned to the transportation sector.

[g] Conventional hydroelectricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[h] Geothermal electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[i] Solar photovoltaic (PV) and solar thermal electricity net generation in the electric power sector (converted to Btu by multiplying by the heat content of electricity in Table A6). See Table 10.5.

[j] Wind electricity net generation (converted to Btu by multiplying by the heat content of electricity in Table A6).

[k] Wood and wood-derived fuels.

[l] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

R=Revised. NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • Transportation sector data are estimates, except for biodiesel beginning in 2012, and renewable diesel fuel and other biofuels beginning in 2021. • 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/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: See end of section.

Table 10.3 Fuel Ethanol Overview

	Feedstock[b]	Losses and Co-products[c]	Denaturant[d]	Production[a]			Trade[a] Net Imports[e]	Stocks[a,f]	Stock Change[a,g]	Consumption[a]			Consumption Minus Denaturant[h]
	TBtu	TBtu	Mbbl	Mbbl	MMgal	TBtu	Mbbl	Mbbl	Mbbl	Mbbl	MMgal	TBtu	*TBtu*
1981 Total	**13**	**6**	**40**	**1,978**	**83**	**7**	**NA**	**NA**	**NA**	**1,978**	**83**	**7**	***7***
1985 Total	**93**	**42**	**294**	**14,693**	**617**	**52**	**NA**	**NA**	**NA**	**14,693**	**617**	**52**	***51***
1990 Total	**111**	**49**	**356**	**17,802**	**748**	**63**	**NA**	**NA**	**NA**	**17,802**	**748**	**63**	***62***
1995 Total	**198**	**86**	**647**	**32,325**	**1,358**	**115**	**387**	**2,186**	**-207**	**32,919**	**1,383**	**117**	***114***
2000 Total	**233**	**99**	**773**	**38,627**	**1,622**	**138**	**116**	**3,400**	**-624**	**39,367**	**1,653**	**140**	***137***
2005 Total	**550**	**227**	**1,859**	**92,961**	**3,904**	**331**	**3,234**	**5,563**	**-439**	**96,634**	**4,059**	**344**	***335***
2006 Total	**683**	**280**	**2,326**	**116,294**	**4,884**	**414**	**17,408**	**8,760**	**3,197**	**130,505**	**5,481**	**465**	***453***
2007 Total	**907**	**368**	**3,105**	**155,263**	**6,521**	**553**	**10,457**	**10,535**	**1,775**	**163,945**	**6,886**	**584**	***569***
2008 Total	**1,286**	**518**	**4,433**	**221,637**	**9,309**	**790**	**12,610**	**14,226**	**3,691**	**230,556**	**9,683**	**822**	***800***
2009 Total	**1,503**	**602**	**5,688**	**260,424**	**10,938**	**928**	**4,720**	**16,594**	**2,368**	**262,776**	**11,037**	**937**	***910***
2010 Total	**1,823**	**726**	**6,506**	**316,617**	**13,298**	**1,128**	**-9,115**	**17,941**	**1,347**	**306,155**	**12,858**	**1,091**	***1,061***
2011 Total	**1,904**	**754**	**6,649**	**331,646**	**13,929**	**1,181**	**-24,365**	**18,238**	**297**	**306,984**	**12,893**	**1,093**	***1,065***
2012 Total	**1,801**	**709**	**6,264**	**314,714**	**13,218**	**1,120**	**-5,891**	**20,350**	**2,112**	**306,711**	**12,882**	**1,092**	***1,064***
2013 Total	**1,809**	**711**	**6,181**	**316,493**	**13,293**	**1,127**	**-5,761**	**16,424**	**-3,926**	**314,658**	**13,216**	**1,120**	***1,092***
2014 Total	**1,947**	**764**	**6,476**	**340,781**	**14,313**	**1,213**	**-18,371**	**18,739**	**2,315**	**320,095**	**13,444**	**1,139**	***1,111***
2015 Total	**2,013**	**788**	**6,636**	**352,553**	**14,807**	**1,254**	**-17,632**	**21,596**	**2,857**	**332,064**	**13,947**	**1,181**	***1,153***
2016 Total	**2,092**	**818**	**6,920**	**366,981**	**15,413**	**1,306**	**-27,002**	**19,758**	**-1,838**	**341,817**	**14,356**	**1,216**	***1,187***
2017 Total	**2,164**	**844**	**6,657**	**379,435**	**15,936**	**1,349**	**-31,268**	**23,043**	**3,285**	**344,882**	**14,485**	**1,226**	***1,199***
2018 Total	**2,187**	**852**	**5,819**	**383,127**	**16,091**	**1,361**	**-39,410**	**23,418**	**375**	**343,342**	**14,420**	**1,220**	***1,197***
2019 Total	**2,140**	**832**	**6,089**	**375,678**	**15,778**	**1,336**	**-30,276**	**22,352**	**-1,066**	**346,468**	**14,552**	**1,232**	***1,206***
2020 Total	**1,886**	**732**	**5,892**	**331,928**	**13,941**	**1,181**	**-27,692**	**24,663**	**2,311**	**301,925**	**12,681**	**1,074**	***1,050***
2021 January	164	63	491	28,809	1,210	102	-3,875	26,117	1,454	23,480	986	83	*82*
February	130	50	391	22,895	962	81	-2,227	24,712	-1,405	22,073	927	78	*77*
March	166	65	507	29,327	1,232	104	-3,409	22,869	-1,843	27,761	1,166	99	*97*
April	160	62	475	28,213	1,185	100	-2,508	22,368	-500	26,205	1,101	93	*91*
May	177	69	535	31,224	1,311	111	-1,897	22,057	-312	29,639	1,245	105	*103*
June	174	67	528	30,641	1,287	109	-1,668	21,980	-77	29,049	1,220	103	*101*
July	179	69	542	31,449	1,321	112	-883	22,656	676	29,890	1,255	106	*104*
August	165	64	471	29,087	1,222	103	-1,643	21,135	-1,521	28,965	1,217	103	*101*
September	160	62	466	28,080	1,179	100	-1,603	20,235	-900	27,377	1,150	97	*95*
October	183	71	529	32,276	1,356	115	-2,207	20,067	-169	30,237	1,270	107	*105*
November	184	71	548	32,383	1,360	115	-3,190	20,503	436	28,757	1,208	102	*100*
December	188	73	613	33,132	1,392	118	-3,023	22,036	1,533	28,576	1,200	102	*99*
Total	**2,030**	**786**	**6,094**	**357,517**	**15,016**	**1,271**	**-28,135**	**22,036**	**-2,627**	**332,010**	**13,944**	**1,180**	***1,155***
2022 January	183	71	600	32,191	1,352	114	-2,311	25,874	3,838	26,042	1,094	93	*90*
February	161	62	488	28,304	1,189	101	-3,420	26,521	647	24,237	1,018	86	*84*
March	179	70	520	31,581	1,326	112	-2,694	26,700	179	28,708	1,206	102	*100*
April	165	64	435	28,956	1,216	103	-4,628	24,284	-2,416	26,744	1,123	95	*93*
May	178	69	467	31,256	1,313	111	-3,064	23,426	-858	29,049	1,220	103	*101*
June	178	69	485	31,288	1,314	111	-2,360	23,384	-41	28,969	1,217	103	*101*
July	179	69	470	31,498	1,323	112	-2,615	24,197	813	28,070	1,179	100	*98*
August	174	67	460	30,520	1,282	108	-1,469	23,509	-688	29,740	1,249	106	*104*
September	154	60	400	27,072	1,137	96	-2,144	21,540	-1,969	26,896	1,130	96	*94*
October	179	69	493	31,440	1,321	112	-1,843	21,708	168	29,430	1,236	105	*103*
November	179	69	539	31,580	1,326	112	-1,414	23,575	1,867	28,299	1,189	101	*98*
December	171	66	512	30,046	1,262	107	-1,668	24,245	670	27,708	1,164	98	*96*
Total	**2,079**	**805**	**5,869**	**365,731**	**15,361**	**1,299**	**-29,631**	**24,245**	**2,209**	**333,891**	**14,023**	**1,186**	***1,163***
2023 January	177	69	541	31,189	1,310	111	-2,812	25,383	[i] 957	27,421	1,152	97	*95*
February	160	62	477	28,089	1,180	100	-2,483	26,299	917	24,690	1,037	88	*86*
March	175	68	514	30,753	1,292	109	-3,158	24,951	-1,349	28,944	1,216	103	*101*
April	166	64	500	29,236	1,228	104	-3,000	24,085	-865	27,102	1,138	96	*94*
May	176	68	515	31,016	1,303	110	-2,704	23,110	-975	29,287	1,230	104	*102*
June	177	69	519	31,146	1,308	111	-2,675	22,299	-812	29,283	1,230	104	*102*
July	182	70	527	32,024	1,345	114	-2,664	23,101	802	28,558	1,199	101	*99*
August	177	68	531	31,137	1,308	111	-2,193	21,815	-1,285	30,229	1,270	107	*105*
September	172	67	496	30,290	1,272	108	-2,516	22,174	359	27,416	1,151	97	*95*
October	181	70	538	31,870	1,339	113	-2,796	21,309	-866	29,940	1,257	106	*104*
November	180	70	534	31,609	1,328	112	-2,768	21,885	576	28,265	1,187	100	*98*
December	191	74	545	33,534	1,408	119	-3,713	23,589	1,705	28,116	1,181	100	*98*
Total	**2,112**	**818**	**6,236**	**371,895**	**15,620**	**1,322**	**-33,481**	**23,589**	[i] **-837**	**339,251**	**14,249**	**1,206**	***1,180***

[a] Includes denaturant.
[b] Total corn and other biomass inputs to the production of undenatured ethanol used for fuel ethanol.
[c] Losses and co-products from the production of fuel ethanol. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol—these are included in the industrial sector consumption statistics for the appropriate energy source.
[d] The amount of denaturant in fuel ethanol produced.
[e] Through 2009, data are for fuel ethanol imports only; data for fuel ethanol exports are not available. Beginning in 2010, data are for fuel ethanol imports minus fuel ethanol (including industrial alcohol) exports.
[f] Stocks are at end of period.
[g] A negative value indicates a decrease in stocks and a positive value indicates an increase.
[h] Consumption of fuel ethanol minus denaturant. Data for fuel ethanol minus denaturant are used to develop data for "Renewable Energy/Biomass" in Tables 10.1–10.2b, as well as in Sections 1 and 2.
[i] Derived from the preliminary 2022 stocks value (24,426 thousand barrels), not the final 2022 value (24,245 thousand barrels) that is shown under "Stocks."
NA=Not available.

Notes: • Mbbl = thousand barrels. MMgal = million U.S. gallons. TBtu = trillion Btu. • Fuel ethanol data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to Btu by multiplying by the approximate heat content of fuel ethanol—see Table A3. • Through 1980, data are not available. For 1981–1992, data are estimates. For 1993–2008, only data for feedstock, losses and co-products, and denaturant are estimates. Beginning in 2009, only data for feedstock, and losses and co-products, are estimates. • See "Denaturant," "Ethanol," "Fuel Ethanol," and "Fuel Ethanol Minus Denaturant" in Glossary. • 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/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 1981.

Sources: See end of section.

Table 10.4a Biodiesel Overview

	Feedstock[b]	Losses and Co-products[c]	Production[a]			Trade[a]			Stocks[a,e]	Stock Change[a,f]	Consumption[a]		
						Imports	Exports	Net Imports[d]					
	TBtu	TBtu	Mbbl	MMgal	TBtu	Mbbl	Mbbl	Mbbl	Mbbl	Mbbl	Mbbl	MMgal	TBtu
2001 Total	**1**	**(s)**	**204**	**9**	**1**	**81**	**41**	**40**	**NA**	**NA**	**244**	**10**	**1**
2005 Total	**12**	**(s)**	**2,162**	**91**	**12**	**214**	**213**	**1**	**NA**	**NA**	**2,163**	**91**	**12**
2006 Total	**32**	**(s)**	**5,963**	**250**	**32**	**1,105**	**856**	**250**	**NA**	**NA**	**6,213**	**261**	**33**
2007 Total	**63**	**1**	**11,662**	**490**	**62**	**3,455**	**6,696**	**-3,241**	**NA**	**NA**	**8,422**	**354**	**45**
2008 Total	**88**	**1**	**16,145**	**678**	**87**	**7,755**	**16,673**	**-8,918**	**NA**	**NA**	**7,228**	**304**	**39**
2009 Total	**67**	**1**	**12,281**	**516**	**66**	**1,906**	**6,546**	**-4,640**	**711**	**711**	**[g] 7,663**	**322**	**41**
2010 Total	**44**	**1**	**8,177**	**343**	**44**	**564**	**2,588**	**-2,024**	**672**	**-39**	**6,192**	**260**	**33**
2011 Total	**125**	**2**	**23,035**	**967**	**123**	**890**	**1,799**	**-908**	**2,005**	**[h] 1,028**	**21,099**	**886**	**113**
2012 Total	**128**	**2**	**23,588**	**991**	**126**	**853**	**3,056**	**-2,203**	**1,984**	**-20**	**21,406**	**899**	**115**
2013 Total	**176**	**2**	**32,368**	**1,359**	**173**	**8,152**	**4,675**	**3,477**	**3,810**	**1,825**	**34,020**	**1,429**	**182**
2014 Total	**165**	**2**	**30,452**	**1,279**	**163**	**4,578**	**1,974**	**2,604**	**3,131**	**-679**	**33,735**	**1,417**	**181**
2015 Total	**163**	**2**	**30,080**	**1,263**	**161**	**8,399**	**2,091**	**6,308**	**3,943**	**813**	**35,575**	**1,494**	**191**
2016 Total	**203**	**3**	**37,327**	**1,568**	**200**	**16,879**	**2,098**	**14,781**	**6,398**	**2,454**	**49,653**	**2,085**	**266**
2017 Total	**206**	**3**	**37,993**	**1,596**	**204**	**9,374**	**2,228**	**7,146**	**4,268**	**-2,130**	**47,269**	**1,985**	**253**
2018 Total	**240**	**3**	**44,222**	**1,857**	**237**	**3,969**	**2,470**	**1,499**	**4,662**	**394**	**45,326**	**1,904**	**243**
2019 Total	**223**	**3**	**41,060**	**1,725**	**220**	**4,078**	**2,730**	**1,348**	**3,907**	**-756**	**43,163**	**1,813**	**231**
2020 Total	**235**	**3**	**43,207**	**1,815**	**232**	**4,684**	**3,458**	**1,226**	**3,665**	**-241**	**44,675**	**1,876**	**239**
2021 January	18	(s)	3,352	141	18	228	166	62	4,580	915	2,499	105	13
February	14	(s)	2,578	108	14	263	122	141	4,189	-391	3,110	131	17
March	19	(s)	3,585	151	19	361	267	94	4,284	94	3,585	151	19
April	19	(s)	3,430	144	18	500	494	6	4,183	-101	3,536	149	19
May	19	(s)	3,537	149	19	316	564	-248	3,805	-379	3,668	154	20
June	19	(s)	3,415	143	18	446	658	-212	3,748	-57	3,260	137	17
July	19	(s)	3,552	149	19	357	489	-132	3,697	-51	3,470	146	19
August	19	(s)	3,560	150	19	287	549	-262	3,369	-328	3,626	152	19
September	17	(s)	3,185	134	17	418	474	-56	3,230	-139	3,268	137	18
October	19	(s)	3,473	146	19	473	213	260	3,340	110	3,623	152	19
November	18	(s)	3,360	141	18	660	166	494	3,747	407	3,447	145	18
December	20	(s)	3,661	154	20	696	291	405	4,187	441	3,626	152	19
Total	**221**	**3**	**40,686**	**1,709**	**218**	**5,005**	**4,452**	**553**	**4,187**	**522**	**40,717**	**1,710**	**218**
2022 January	16	(s)	2,857	120	15	388	209	179	4,544	356	2,680	113	14
February	15	(s)	2,707	114	15	121	124	-3	4,457	-86	2,790	117	15
March	17	(s)	3,161	133	17	636	171	465	4,692	234	3,391	142	18
April	16	(s)	3,018	127	16	672	632	40	4,212	-479	3,537	149	19
May	18	(s)	3,242	136	17	315	699	-384	3,839	-373	3,230	136	17
June	18	(s)	3,265	137	17	346	589	-243	3,404	-435	3,458	145	19
July	19	(s)	3,490	147	19	284	625	-341	3,240	-164	3,313	139	18
August	19	(s)	3,519	148	19	371	831	-460	2,894	-347	3,405	143	18
September	18	(s)	3,350	141	18	405	641	-236	2,826	-67	3,182	134	17
October	19	(s)	3,464	145	19	658	468	190	2,903	77	3,577	150	19
November	18	(s)	3,384	142	18	903	221	682	3,232	329	3,737	157	20
December	17	(s)	3,164	133	17	851	462	389	3,608	376	3,178	133	17
Total	**210**	**3**	**38,620**	**1,622**	**207**	**5,950**	**5,671**	**279**	**3,608**	**-580**	**39,478**	**1,658**	**212**
2023 January	18	(s)	3,242	136	17	930	92	838	4,297	[i] 698	3,383	142	18
February	15	(s)	2,840	119	15	952	132	820	4,861	564	3,096	130	17
March	18	(s)	3,325	140	18	916	261	655	5,055	194	3,787	159	20
April	17	(s)	3,164	133	17	1,000	1,044	-44	4,847	-209	3,328	140	18
May	20	(s)	3,722	156	20	832	757	75	4,413	-433	4,230	178	23
June	20	(s)	3,636	153	19	1,016	839	177	3,978	-435	4,249	178	23
July	20	(s)	3,612	152	19	725	691	34	3,719	-259	3,905	164	21
August	19	(s)	3,458	145	19	991	553	438	3,589	-130	4,027	169	22
September	19	(s)	3,438	144	18	1,280	410	870	3,576	-13	4,321	181	23
October	19	(s)	3,495	147	19	1,017	451	566	3,514	-61	4,122	173	22
November	18	(s)	3,231	136	17	1,239	361	878	3,675	160	3,948	166	21
December	18	(s)	3,286	138	18	1,031	391	640	3,827	153	3,773	158	20
Total	**220**	**3**	**40,447**	**1,699**	**217**	**11,929**	**5,980**	**5,949**	**3,827**	**[i] 228**	**46,168**	**1,939**	**247**

[a] Data are for "biodiesel," which is primarily fatty acid methyl esters (FAME). See "Biodiesel" in Glossary.

[b] Total vegetable oil and other biomass inputs to the production of biodiesel. See "Biodiesel Feedstock" entry in the "Thermal Conversion Factor Source Documentation" at the end of Appendix A.

[c] Losses and co-products from the production of biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of biodiesel—these are included in the industrial sector consumption statistics for the appropriate energy source.

[d] Net imports equal imports minus exports.

[e] Stocks are at end of period. Includes biodiesel stocks at (or in) refineries, pipelines, and bulk terminals. Beginning in 2011, also includes stocks at biodiesel production plants.

[f] A negative value indicates a decrease in stocks and a positive value indicates an increase.

[g] In 2009, because of incomplete data coverage and differing data sources, a "Balancing Item" amount of 733 thousand barrels (653 thousand barrels in January 2009; 80 thousand barrels in February 2009) is used to balance biodiesel supply and disposition.

[h] Derived from the final 2010 stocks value for bulk terminals and biodiesel production plants (977 thousand barrels), not the final 2010 value for bulk terminals only (672 thousand barrels) that is shown under "Stocks."

[i] Derived from the preliminary 2022 stocks value (3,599 thousand barrels), not the final 2022 value (3,608 thousand barrels) that is shown under "Stocks."

NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • Mbbl = thousand barrels. MMgal = million U.S. gallons. TBtu = trillion Btu. • Biodiesel data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to Btu by multiplying by 5.359 million Btu per barrel (the approximate heat content of biodiesel—see Table A1). • Through 2000, data are not available. Beginning in 2001, data not from EIA surveys are estimates. • 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/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 2001.

Sources: See end of section.

Table 10.4b Renewable Diesel Fuel Overview

	Feedstock[c]	Losses and Co-products[d]	Production[a,e]			Trade[a,b] Imports	Stocks[a,f]	Stock Change[a,g]	Consumption[a,h]		
	TBtu	TBtu	Mbbl	MMgal	TBtu	Mbbl	Mbbl	Mbbl	Mbbl	MMgal	TBtu
2011 Total	**NA**	**NA**	**1,477**	**62**	**8**	**–**	**7**	**7**	**1,470**	**62**	**8**
2012 Total	**NA**	**NA**	**1,248**	**52**	**7**	**605**	**94**	**87**	**1,766**	**74**	**10**
2013 Total	**NA**	**NA**	**2,697**	**113**	**15**	**4,921**	**691**	**597**	**7,021**	**295**	**39**
2014 Total	**NA**	**NA**	**3,789**	**159**	**21**	**2,873**	**350**	**-341**	**7,003**	**294**	**38**
2015 Total	**NA**	**NA**	**4,211**	**177**	**23**	**4,874**	**634**	**284**	**8,801**	**370**	**48**
2016 Total	**NA**	**NA**	**5,750**	**241**	**32**	**5,304**	**1,315**	**681**	**10,373**	**436**	**57**
2017 Total	**NA**	**NA**	**6,151**	**258**	**34**	**4,509**	**753**	**-562**	**11,222**	**471**	**62**
2018 Total	**NA**	**NA**	**7,273**	**305**	**40**	**4,124**	**1,727**	**974**	**10,423**	**438**	**57**
2019 Total	**NA**	**NA**	**11,715**	**492**	**64**	**6,143**	**1,491**	**-236**	**18,094**	**760**	**99**
2020 Total	**NA**	**NA**	**12,702**	**533**	**70**	**6,658**	**1,287**	**-204**	**19,564**	**822**	**107**
2021 January	NA	NA	[e] 1,415	[e] 59	[e] 8	771	1,713	426	1,760	74	10
February	NA	NA	1,268	53	7	741	1,979	266	1,744	73	10
March	NA	NA	1,356	57	7	893	1,967	-11	2,261	95	12
April	NA	NA	1,264	53	7	1,013	1,922	-46	2,323	98	13
May	NA	NA	1,574	66	9	870	1,760	-162	2,605	109	14
June	NA	NA	1,470	62	8	1,092	1,920	160	2,402	101	13
July	NA	NA	1,889	79	10	549	2,283	363	2,075	87	11
August	NA	NA	1,800	76	10	597	2,037	-246	2,643	111	15
September	NA	NA	1,463	61	8	636	2,174	137	1,962	82	11
October	NA	NA	2,027	85	11	795	1,883	-291	3,114	131	17
November	NA	NA	2,255	95	12	890	2,107	223	2,921	123	16
December	NA	NA	2,720	114	15	493	2,353	246	2,967	125	16
Total	**NA**	**NA**	**20,503**	**861**	**113**	**9,340**	**2,353**	**1,066**	**28,777**	**1,209**	**158**
2022 January	NA	NA	2,632	111	14	632	2,710	357	2,907	122	16
February	NA	NA	2,300	97	13	359	2,748	38	2,620	110	14
March	NA	NA	2,596	109	14	555	2,705	-43	3,194	134	18
April	NA	NA	2,837	119	16	392	2,872	167	3,062	129	17
May	NA	NA	3,008	126	17	649	3,273	401	3,256	137	18
June	NA	NA	2,948	124	16	536	2,742	-532	4,016	169	22
July	NA	NA	3,086	130	17	593	3,148	407	3,272	137	18
August	NA	NA	2,832	119	16	421	2,554	-594	3,847	162	21
September	NA	NA	3,289	138	18	304	2,698	144	3,450	145	19
October	NA	NA	3,079	129	17	451	2,235	-463	3,993	168	22
November	NA	NA	3,465	146	19	692	3,087	852	3,305	139	18
December	NA	NA	3,619	152	20	670	3,405	318	3,971	167	22
Total	**NA**	**NA**	**35,692**	**1,499**	**196**	**6,254**	**3,405**	**1,053**	**40,893**	**1,718**	**225**
2023 January	NA	NA	3,994	168	22	633	3,557	152	4,475	188	25
February	NA	NA	3,752	158	21	546	3,565	8	4,290	180	24
March	NA	NA	4,740	199	26	786	3,919	354	5,173	217	28
April	NA	NA	4,789	201	26	420	4,034	115	5,093	214	28
May	NA	NA	5,377	226	30	1,149	3,638	-397	6,923	291	38
June	NA	NA	5,482	230	30	681	3,421	-217	6,379	268	35
July	NA	NA	5,086	214	28	783	4,038	618	5,251	221	29
August	NA	NA	5,798	244	32	1,003	4,039	1	6,800	286	37
September	NA	NA	5,968	251	33	405	4,221	181	6,192	260	34
October	NA	NA	5,018	211	28	351	3,668	-553	5,921	249	33
November	NA	NA	5,321	223	29	813	4,985	1,317	4,817	202	26
December	NA	NA	6,420	270	35	1,052	5,478	493	6,979	293	38
Total	**NA**	**NA**	**61,744**	**2,593**	**339**	**8,622**	**5,478**	**2,072**	**68,294**	**2,868**	**375**

[a] Data are for "renewable diesel fuel," which is commonly called "non-ester renewable diesel" and "green diesel," and which is chemically similar to petroleum diesel fuel.

[b] Data are for imports only; data for exports are not available.

[c] Total vegetable oil and other biomass inputs to the production of renewable diesel fuel.

[d] Losses and co-products from the production of renewable diesel fuel. Does not include natural gas, electricity, and other non-biomass energy used in the production of renewable diesel fuel—these are included in the industrial sector consumption statistics for the appropriate energy source.

[e] Through 2020, production data are from U.S. Environmental Protection Agency. Beginning in 2021, production data are from EIA. See sources at end of section.

[f] Stocks are at end of period. Includes renewable diesel fuel stocks at refineries and bulk terminals. Beginning in 2021, also includes renewable diesel fuel stocks at renewable fuel production plants.

[g] A negative value indicates a decrease in stocks and a positive value indicates an increase.

[h] Consumption, which is calculated as production plus imports minus stock change, also includes amounts of exports that cannot currently be differentiated from consumption.

NA=Not available. – =No data reported.

Notes: • Mbbl = thousand barrels. MMgal = million U.S. gallons. TBtu = trillion Btu. • Renewable diesel fuel data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to Btu by multiplying by 5.494 million Btu per barrel (the approximate heat content of renewable diesel fuel–see Table A1). • Through 2010, data are not available, or there is incomplete data coverage. Beginning in 2011, data not from EIA surveys are estimates. • 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/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 2011.

Sources: See end of section.

Table 10.4c Other Biofuels Overview

	Feed-stock[c]	Losses and Co-products[d]	Production[a,e]			Trade[a,b] Imports	Stocks[a,f]	Stock Change[a,g]	Consumption[a,h]		
	TBtu	TBtu	Mbbl	MMgal	TBtu	Mbbl	Mbbl	Mbbl	Mbbl	MMgal	TBtu
2014 Total	**NA**	**NA**	**290**	**12**	**2**	**–**	**7**	**2**	**288**	**12**	**2**
2015 Total	**NA**	**NA**	**393**	**17**	**2**	**–**	**4**	**-3**	**396**	**17**	**2**
2016 Total	**NA**	**NA**	**503**	**21**	**3**	**–**	**43**	**39**	**464**	**20**	**2**
2017 Total	**NA**	**NA**	**570**	**24**	**3**	**–**	**28**	**-15**	**585**	**25**	**3**
2018 Total	**NA**	**NA**	**611**	**26**	**3**	**–**	**54**	**26**	**585**	**25**	**3**
2019 Total	**NA**	**NA**	**791**	**33**	**4**	**–**	**50**	**-4**	**795**	**33**	**4**
2020 Total	**NA**	**NA**	**761**	**32**	**4**	**–**	**27**	**-23**	**784**	**33**	**4**
2021 January[i]	NA	NA	[e] 179	[e] 8	[e] 1	–	136	109	70	3	(s)
February	NA	NA	172	7	1	–	151	16	156	7	1
March	NA	NA	165	7	1	–	131	-20	185	8	1
April	NA	NA	140	6	1	–	101	-29	169	7	1
May	NA	NA	127	5	1	–	119	18	109	5	1
June	NA	NA	91	4	(s)	–	74	-45	136	6	1
July	NA	NA	125	5	1	27	89	15	137	6	1
August	NA	NA	139	6	1	–	85	-4	144	6	1
September	NA	NA	98	4	1	–	71	-13	112	5	1
October	NA	NA	191	8	1	–	90	18	173	7	1
November	NA	NA	227	10	1	–	69	-21	248	10	1
December	NA	NA	261	11	1	–	83	14	247	10	1
Total	**NA**	**NA**	**1,914**	**80**	**10**	**27**	**83**	**56**	**1,885**	**79**	**10**
2022 January	NA	NA	308	13	2	–	211	129	179	8	1
February	NA	NA	306	13	2	–	290	79	227	10	1
March	NA	NA	279	12	1	–	292	2	277	12	1
April	NA	NA	327	14	2	50	258	-34	411	17	2
May	NA	NA	335	14	2	–	217	-41	377	16	2
June	NA	NA	365	15	2	–	191	-26	391	16	2
July	NA	NA	437	18	2	–	190	-1	438	18	2
August	NA	NA	447	19	2	12	179	-11	470	20	3
September	NA	NA	448	19	2	–	176	-3	450	19	2
October	NA	NA	478	20	3	–	178	1	477	20	3
November	NA	NA	504	21	3	–	244	66	437	18	2
December	NA	NA	607	26	3	52	282	38	621	26	3
Total	**NA**	**NA**	**4,841**	**203**	**26**	**114**	**282**	**200**	**4,756**	**200**	**25**
2023 January	NA	NA	562	24	3	–	229	-54	616	26	3
February	NA	NA	504	21	3	–	359	130	375	16	2
March	NA	NA	570	24	3	–	343	-15	585	25	3
April	NA	NA	444	19	2	–	331	-12	456	19	2
May	NA	NA	565	24	3	–	304	-27	592	25	3
June	NA	NA	616	26	3	5	370	66	555	23	3
July	NA	NA	478	20	3	52	285	-85	615	26	3
August	NA	NA	521	22	3	7	406	121	406	17	2
September	NA	NA	601	25	3	–	265	-141	742	31	4
October	NA	NA	714	30	4	–	325	60	654	27	4
November	NA	NA	592	25	3	–	301	-25	616	26	3
December	NA	NA	721	30	4	48	305	4	765	32	4
Total	**NA**	**NA**	**6,888**	**289**	**37**	**112**	**305**	**22**	**6,978**	**293**	**37**

[a] Data are for renewable heating oil, renewable jet fuel (sustainable aviation fuel), renewable naphtha and gasoline, biobutanol, and other biofuels and biointermediates.

[b] Data are for imports only; data for exports are not available.

[c] Total vegetable oil and other biomass inputs to the production of other biofuels.

[d] Losses and co-products from the production of other biofuels. Does not include natural gas, electricity, and other non-biomass energy used in the production of other biofuels—these are included in the industrial sector consumption statistics for the appropriate energy source.

[e] Through 2020, production data are from U.S. Environmental Protection Agency. Beginning in 2021, production data are from EIA. See sources at end of section.

[f] Stocks are at end of period. Includes other biofuels stocks at refineries and bulk terminals. Beginning in 2021, also includes other biofuels stocks at renewable fuel production plants.

[g] A negative value indicates a decrease in stocks and a positive value indicates an increase.

[h] Consumption, which is calculated as production plus imports minus stock change, also includes amounts of exports that cannot currently be differentiated from consumption.

[i] There is a discontinuity in the time series between 2020 and 2021. Beginning in 2021, there is expanded coverage of other biofuels due to the incorporation of data from EIA, Form EIA-819, "Monthly Report of Biofuels, Fuels from Non-Biogenic Wastes, Fuel Oxygenates, Isooctane, and Isooctene."

NA=Not available. – =No data reported. (s)=Less than 0.5 trillion Btu.

Notes: • Mbbl = thousand barrels. MMgal = million U.S. gallons. TBtu = trillion Btu. • Other biofuels data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to Btu by multiplying by 5.359 million Btu per barrel (the approximate heat content of other biofuels–see Table A1). • Through 2013, data are not available, or there is incomplete data coverage. Beginning in 2014, data not from EIA surveys are estimates. • 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/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 2014.

Sources: See end of section.

Table 10.5 Solar Energy Consumption

(Trillion Btu)

	Small-Scale[a] Solar Energy[b]						Utility-Scale[c] Solar Energy[b]				
		Electricity[d]					Electricity[e]				
	Heat[f]	Residential Sector	Commercial Sector	Industrial Sector	Total	Total[g]	Commercial Sector[h]	Industrial Sector[i]	Electric Power Sector[j]	Total	Total[k]
1985 Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**(s)**	**(s)**	**(s)**
1990 Total	**55**	**(s)**	**(s)**	**(s)**	**(s)**	**55**	**–**	**–**	**1**	**1**	**56**
1995 Total	**63**	**(s)**	**(s)**	**(s)**	**(s)**	**63**	**–**	**–**	**2**	**2**	**64**
2000 Total	**57**	**(s)**	**(s)**	**(s)**	**(s)**	**58**	**–**	**–**	**2**	**2**	**59**
2005 Total	**49**	**(s)**	**1**	**(s)**	**1**	**50**	**–**	**–**	**2**	**2**	**52**
2006 Total	**51**	**1**	**1**	**(s)**	**2**	**52**	**–**	**–**	**2**	**2**	**54**
2007 Total	**53**	**1**	**1**	**(s)**	**2**	**55**	**–**	**–**	**2**	**2**	**57**
2008 Total	**54**	**1**	**2**	**(s)**	**4**	**58**	**(s)**	**–**	**3**	**3**	**61**
2009 Total	**55**	**2**	**3**	**1**	**5**	**59**	**(s)**	**–**	**3**	**3**	**63**
2010 Total	**56**	**3**	**4**	**1**	**8**	**64**	**(s)**	**(s)**	**4**	**4**	**68**
2011 Total	**58**	**5**	**6**	**1**	**12**	**70**	**(s)**	**(s)**	**6**	**6**	**76**
2012 Total	**59**	**7**	**10**	**2**	**20**	**79**	**1**	**(s)**	**14**	**15**	**94**
2013 Total	**61**	**11**	**14**	**3**	**28**	**89**	**1**	**(s)**	**30**	**31**	**120**
2014 Total	**62**	**17**	**18**	**4**	**38**	**101**	**1**	**(s)**	**59**	**60**	**161**
2015 Total	**63**	**24**	**19**	**5**	**48**	**111**	**1**	**(s)**	**83**	**85**	**196**
2016 Total	**64**	**36**	**21**	**7**	**64**	**128**	**2**	**(s)**	**121**	**123**	**251**
2017 Total	**65**	**48**	**26**	**8**	**82**	**147**	**2**	**(s)**	**180**	**182**	**329**
2018 Total	**65**	**58**	**33**	**9**	**101**	**166**	**2**	**(s)**	**216**	**218**	**384**
2019 Total	**65**	**71**	**38**	**10**	**119**	**184**	**2**	**(s)**	**243**	**245**	**430**
2020 Total	**65**	**86**	**44**	**12**	**142**	**207**	**2**	**(s)**	**302**	**304**	**511**
2021 January	4	6	3	1	9	13	(s)	(s)	19	19	32
February	4	6	3	1	10	14	(s)	(s)	21	22	36
March	6	9	4	1	14	20	(s)	(s)	32	32	51
April	6	10	5	1	16	22	(s)	(s)	37	37	59
May	7	11	5	1	17	24	(s)	(s)	42	43	67
June	7	11	5	1	17	24	(s)	(s)	41	42	66
July	7	11	5	1	18	25	(s)	(s)	41	42	66
August	7	10	5	1	17	23	(s)	(s)	41	41	64
September	6	9	5	1	15	21	(s)	(s)	38	38	59
October	5	8	4	1	13	18	(s)	(s)	31	32	50
November	4	7	3	1	11	15	(s)	(s)	26	27	42
December	4	6	3	1	10	14	(s)	(s)	21	21	35
Total	**66**	**103**	**52**	**13**	**168**	**234**	**2**	**(s)**	**391**	**393**	**627**
2022 January	4	7	3	1	12	15	(s)	(s)	27	27	42
February	4	8	4	1	13	17	(s)	(s)	31	31	47
March	5	11	5	1	17	23	(s)	(s)	40	40	63
April	6	12	6	1	19	25	(s)	(s)	45	46	71
May	7	14	6	1	21	28	(s)	(s)	51	52	79
June	7	14	6	1	21	28	(s)	(s)	54	55	83
July	7	14	6	1	22	29	(s)	(s)	53	54	83
August	7	14	6	1	21	28	(s)	(s)	49	49	77
September	6	12	5	1	19	25	(s)	(s)	45	45	70
October	5	11	5	1	17	22	(s)	(s)	40	41	63
November	4	9	4	1	14	18	(s)	(s)	28	29	47
December	4	8	3	1	13	16	(s)	(s)	23	23	40
Total	**65**	**135**	**60**	**14**	**209**	**274**	**2**	**1**	**487**	**491**	**765**
2023 January	4	9	4	1	14	17	(s)	(s)	27	27	44
February	4	10	4	1	15	19	(s)	(s)	31	32	51
March	5	14	6	1	20	26	(s)	(s)	41	41	67
April	6	15	6	1	23	29	(s)	(s)	50	50	79
May	7	17	7	2	26	32	(s)	(s)	57	58	90
June	7	17	7	2	25	32	(s)	(s)	60	60	92
July	7	18	7	2	26	33	(s)	(s)	64	64	R 98
August	7	18	7	2	26	32	(s)	(s)	60	61	93
September	6	15	6	1	23	R 28	(s)	(s)	53	53	82
October	5	14	5	1	21	26	(s)	(s)	48	48	74
November	4	12	4	1	17	21	(s)	(s)	35	35	56
December	4	11	4	1	15	19	(s)	(s)	31	31	51
Total	**65**	**170**	**66**	**15**	**251**	**316**	**2**	**1**	**558**	**561**	**878**

[a] Data are estimates for small-scale facilities (combined generator nameplate capacity less than 1 megawatt).

[b] See "Photovoltaic Energy" and "Solar Thermal Energy" in Glossary.

[c] Data are for utility-scale facilities (combined generator nameplate capacity of 1 megawatt or more).

[d] Solar photovoltaic (PV) electricity generation at small-scale facilities connected to the electric power grid (converted to Btu by multiplying by the heat content of electricity in Table A6).

[e] Solar photovoltaic (PV) and solar thermal electricity net generation at utility-scale facilities (converted to Btu by multiplying by the heat content of electricity in Table A6).

[f] Solar thermal direct use energy in the residential, commercial, and industrial sectors for all end uses, such as pool heating, hot water heating, and space heating.

[g] Data are the sum of "Small-Scale Solar Energy Heat" and "Small-Scale Solar Energy Electricity."

[h] Commercial combined-heat-and-power (CHP) and commercial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[i] Industrial combined-heat-and-power (CHP) and industrial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[j] 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. Through 1988, data are for electric utilities only; beginning in 1989, data are for electric utilities and independent power producers.

[k] Data are the sum of "Small-Scale Solar Energy Total" and "Utility-Scale Solar Energy Total."

R=Revised. NA=Not available. – =No data reported. (s)=Less than 0.5 trillion Btu.

Notes: • Small-scale solar energy data for all years, and utility-scale solar energy data for the current two years, are estimates. • 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/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 1984.

Sources: See end of section.

Table 10.6 Solar Electricity Net Generation

(Million Kilowatthours)

	Small-Scale[a] Solar Generation[b]				Utility-Scale[c] Solar Generation[b]				
	Residential Sector	Commercial Sector	Industrial Sector	Total	Commercial Sector[d]	Industrial Sector[e]	Electric Power Sector[f]	Total	Total
1985 Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**11**	**11**	**11**
1990 Total	**12**	**16**	**4**	**32**	**–**	**–**	**367**	**367**	**399**
1995 Total	**20**	**28**	**6**	**54**	**–**	**–**	**497**	**497**	**551**
2000 Total	**39**	**53**	**12**	**104**	**–**	**–**	**493**	**493**	**598**
2005 Total	**121**	**166**	**37**	**324**	**–**	**–**	**550**	**550**	**875**
2006 Total	**177**	**243**	**54**	**473**	**–**	**–**	**508**	**508**	**981**
2007 Total	**250**	**343**	**76**	**668**	**–**	**–**	**612**	**612**	**1,280**
2008 Total	**401**	**551**	**122**	**1,073**	**(s)**	**–**	**864**	**864**	**1,938**
2009 Total	**539**	**740**	**164**	**1,443**	**(s)**	**–**	**891**	**891**	**2,334**
2010 Total	**899**	**1,130**	**250**	**2,280**	**5**	**2**	**1,206**	**1,212**	**3,492**
2011 Total	**1,358**	**1,845**	**409**	**3,612**	**84**	**7**	**1,727**	**1,818**	**5,429**
2012 Total	**2,058**	**3,061**	**678**	**5,797**	**148**	**14**	**4,164**	**4,327**	**10,123**
2013 Total	**3,217**	**4,106**	**909**	**8,232**	**294**	**17**	**8,724**	**9,036**	**17,268**
2014 Total	**4,947**	**5,146**	**1,139**	**11,233**	**371**	**16**	**17,304**	**17,691**	**28,924**
2015 Total	**6,999**	**5,689**	**1,451**	**14,139**	**416**	**21**	**24,456**	**24,893**	**39,032**
2016 Total	**10,595**	**6,158**	**2,060**	**18,812**	**529**	**27**	**35,497**	**36,054**	**54,866**
2017 Total	**13,942**	**7,685**	**2,364**	**23,990**	**521**	**42**	**52,724**	**53,287**	**77,277**
2018 Total	**17,105**	**9,798**	**2,636**	**29,539**	**525**	**47**	**63,253**	**63,825**	**93,365**
2019 Total	**20,914**	**11,002**	**3,041**	**34,957**	**587**	**85**	**71,265**	**71,937**	**106,894**
2020 Total	**25,179**	**12,859**	**3,484**	**41,522**	**586**	**101**	**88,511**	**89,199**	**130,721**
2021 January	1,669	865	216	2,750	30	6	5,523	5,559	8,309
February	1,774	935	230	2,939	31	7	6,293	6,330	9,270
March	2,549	1,280	330	4,158	53	11	9,233	9,296	13,454
April	2,837	1,416	357	4,610	61	12	10,818	10,892	15,502
May	3,135	1,534	394	5,063	66	14	12,377	12,457	17,520
June	3,161	1,551	396	5,107	64	13	12,119	12,197	17,304
July	3,188	1,599	405	5,192	65	13	12,114	12,192	17,384
August	2,994	1,538	392	4,924	61	15	11,890	11,967	16,891
September	2,642	1,373	354	4,370	55	15	11,144	11,214	15,584
October	2,308	1,194	319	3,821	45	12	9,211	9,268	13,089
November	2,068	945	246	3,259	38	11	7,746	7,795	11,054
December	1,857	895	219	2,970	29	8	6,054	6,091	9,061
Total	**30,182**	**15,124**	**3,858**	**49,164**	**598**	**137**	**114,523**	**115,258**	**164,422**
2022 January	2,135	1,012	230	3,376	36	13	7,773	7,822	11,198
February	2,357	1,116	244	3,717	42	15	8,969	9,027	12,744
March	3,252	1,521	348	5,121	56	21	11,618	11,695	16,816
April	3,632	1,662	377	5,671	66	24	13,312	13,402	19,073
May	4,007	1,816	413	6,236	71	28	15,022	15,121	21,357
June	3,997	1,819	413	6,229	74	32	15,946	16,053	22,282
July	4,118	1,894	426	6,438	72	31	15,663	15,766	22,204
August	3,982	1,801	411	6,194	69	30	14,403	14,503	20,697
September	3,569	1,608	368	5,544	61	26	13,199	13,287	18,831
October	3,306	1,383	333	5,022	52	24	11,866	11,942	16,964
November	2,693	1,086	256	4,035	40	18	8,345	8,403	12,438
December	2,462	1,007	229	3,698	29	13	6,735	6,777	10,475
Total	**39,510**	**17,724**	**4,048**	**61,282**	**669**	**276**	**142,852**	**143,797**	**205,079**
2023 January	2,641	R 1,105	246	R 3,992	35	17	R 7,930	R 7,982	R 11,974
February	R 2,908	R 1,231	261	R 4,401	39	19	R 9,193	R 9,251	R 13,652
March	R 3,972	R 1,658	374	R 6,003	R 56	26	R 12,063	R 12,144	R 18,148
April	4,517	R 1,838	412	R 6,768	R 60	30	R 14,666	R 14,755	R 21,523
May	R 5,107	R 2,002	451	R 7,560	70	34	R 16,822	R 16,927	R 24,487
June	R 4,984	R 1,995	451	R 7,429	68	34	R 17,528	R 17,631	R 25,060
July	R 5,209	R 2,073	465	R 7,747	74	37	R 18,769	R 18,880	R 26,626
August	R 5,134	R 1,976	R 446	R 7,556	R 71	34	R 17,711	R 17,816	R 25,372
September	R 4,458	R 1,764	R 401	R 6,623	60	29	R 15,473	R 15,563	R 22,185
October	R 4,203	R 1,526	R 364	R 6,094	52	26	R 14,003	R 14,082	R 20,175
November	R 3,469	R 1,202	287	R 4,958	59	19	R 10,192	R 10,271	R 15,229
December	3,133	1,101	256	4,489	46	21	9,133	9,200	13,689
Total	**49,734**	**19,470**	**4,414**	**73,619**	**690**	**326**	**163,485**	**164,502**	**238,120**

[a] Data are estimates for solar photovoltaic (PV) electricity generation at small-scale facilities (combined generator nameplate capacity less than 1 megawatt) connected to the electric power grid.

[b] See "Photovoltaic Energy" and "Solar Thermal Energy" in Glossary.

[c] Solar photovoltaic (PV) and solar thermal electricity net generation at utility-scale facilities (combined generator nameplate capacity of 1 megawatt or more).

[d] Commercial combined-heat-and-power (CHP) and commercial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[e] Industrial combined-heat-and-power (CHP) and industrial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[f] 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. Through 1988, data are for electric utilities only; beginning in 1989, data are for electric utilities and independent power producers.

R=Revised. NA=Not available. – =No data reported. (s)=Less than 0.5 million kilowatthours.

Notes: • Small-scale solar generation data for all years, and utility-scale solar energy data for the current two years, are estimates. • 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/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 1984.

Sources: • **Small-Scale Solar Generation: 1989–2013**—Calculated as small-scale solar energy consumption (see Table 10.5) divided by the heat content of electricity (see Table A6). **2014 forward**—U.S. Energy Information Administration (EIA), *Electric Power Monthly*, monthly reports, Tables 1.1, 1.2.C, 1.2.D, and 1.2.E. • **Utility-Scale Solar Generation: 1984–1988**—EIA, Form EIA-759, "Monthly Power Plant Report." **1989–1997:** EIA, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report." **1998–2000:** EIA, Form EIA-759, "Monthly Power Plant Report," and Form EIA-860B, "Annual Electric Generator Report—Nonutility." **2001–2003:** EIA, Form EIA-906, "Power Plant Report." **2004–2007:** EIA, Form EIA-906, "Power Plant Report," and Form EIA-920, "Combined Heat and Power Plant Report." **2008 forward:** EIA, Form EIA-923, "Power Plant Operations Report." • **Total:** Calculated as small-scale solar generation plus utility-scale solar generation.

Note. Renewable Energy Production and Consumption. In Tables 1.1, 1.3, and 10.1, renewable energy consumption consists of: conventional hydroelectricity net generation (converted to Btu by multiplying by the electricity heat content factor in Table A6); geothermal electricity net generation (converted to Btu by multiplying by the electricity heat content factor in Table A6), and geothermal heat pump and geothermal direct use energy; solar thermal and photovoltaic electricity net generation (converted to Btu by multiplying by the electricity heat content factor in Table A6), and solar thermal direct use energy; wind electricity net generation (converted to Btu by multiplying by the electricity heat content factor in Table A6); wood and wood-derived fuels consumption; biomass waste (municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass) consumption; fuel ethanol (minus denaturant), biodiesel, renewable diesel fuel, and other biofuels consumption; and losses and co-products from the production of fuel ethanol and biodiesel. In Tables 1.1, 1.2, and 10.1, renewable energy production is assumed to equal consumption for all renewable energy sources except wood and biofuels; plus wood production (which is the sum of wood consumption and densified biomass exports); plus biofuels production (which comprises fuel ethanol feedstock, biodiesel feedstock, renewable diesel fuel production, and other biofuels production).

Table 10.2a Sources

Residential Sector, Geothermal

1989–2011: Annual estimates by the U.S. Energy Information Administration (EIA) based on data from Oregon Institute of Technology, Geo-Heat Center.

2012 forward: Annual estimates assumed by EIA to be equal to that of 2011.

(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

Residential Sector, Solar

1989 forward: Residential sector solar consumption is the sum of the values for "Small-Scale Solar Energy Consumption: Heat" (which includes solar thermal direct use energy in the residential, commercial, and industrial sectors) from Table 10.5 and "Small-Scale Solar Energy Consumption: Electricity, Residential Sector" from Table 10.5.

Residential Sector, Wood

1949–1979: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2.

1980–2008: Annual estimates are based on EIA, Form EIA-457, "Residential Energy Consumption Survey"; and National Oceanic and Atmospheric Administration regional heating degree-day data.

2009 forward: Annual estimates based on EIA, Form EIA-457, “Residential Energy Consumption Survey”; and residential wood consumption growth rates from EIA's *Annual Energy Outlook* data system.

(For 1973 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

Residential Sector, Total Renewable Energy

1949–1988: Residential sector total renewable energy consumption is equal to residential sector wood consumption.

1989 forward: Residential sector total renewable energy consumption is the sum of the residential sector consumption values for geothermal, solar, and wood.

Commercial Sector, Hydroelectric Power

1989 forward: Commercial sector conventional hydroelectricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms, are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Commercial Sector, Geothermal Heat Pump and Direct Use Energy
1989–2011: Annual estimates by EIA based on data from Oregon Institute of Technology, Geo-Heat Center.

2012 forward: Annual estimates assumed by EIA to be equal to that of 2011.

(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

Commercial Sector, Geothermal Electricity Net Generation
December 2018 forward: Commercial sector geothermal electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Commercial Sector, Geothermal Total
1989–November 2018: Commercial sector geothermal total consumption is equal to commercial sector heat pump and direct use energy.

December 2018 forward: Commercial sector geothermal total consumption is the sum of the commercial sector values for geothermal heat pump and direct use energy, and geothermal electricity net generation.

Commercial Sector, Solar
1989 forward: Commercial sector solar consumption is the sum of the values for "Small-Scale Solar Energy Consumption: Electricity, Commercial Sector" from Table 10.5 and "Utility-Scale Solar Energy Consumption: Electricity, Commercial Sector" from Table 10.5.

Commercial Sector, Wind
2009 forward: Commercial sector wind electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Commercial Sector, Wood
1949–1979: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2.

1980–1983: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption 1980 –1983*, Table ES1.

1984: Annual estimate assumed by EIA to be equal to that of 1983.

1985–1988: Annual estimates interpolated by EIA.

(For 1973–1988, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

1989 forward: Monthly/annual commercial sector combined-heat-and-power (CHP) wood consumption data are from EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms. Annual estimates for commercial sector non-CHP wood consumption are based on EIA, Form EIA-871, "Commercial Buildings Energy Consumption Survey" (for 2014–2016, the annual estimates are based on commercial sector biomass consumption growth rates from EIA's *Annual Energy Outlook* data system; for 2017 forward, annual estimates are assumed by EIA to be equal to that of 2016). For 1989 forward, monthly estimates for commercial sector non-CHP wood consumption are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month. Commercial sector total wood consumption is the sum of commercial sector CHP and non-CHP wood consumption.

Commercial Sector, Biomass Waste
1989 forward: Table 7.4c.

Commercial Sector, Fuel Ethanol (Minus Denaturant)
1981 forward: The commercial sector share of motor gasoline consumption is equal to commercial sector motor gasoline consumption from Table 3.7a divided by motor gasoline product supplied from Table 3.5. Commercial sector fuel ethanol (minus denaturant) consumption is equal to fuel ethanol (minus denaturant) consumption from Table 10.3 multiplied by the commercial sector share of motor gasoline consumption. Note that there is a discontinuity in this time

series between 2014 and 2015 due to a change in the method for allocating motor gasoline consumption to the end-use sectors; beginning in 2015, the commercial and industrial sector shares of fuel ethanol consumption are larger than in 2014, while the transportation sector share is smaller.

Commercial Sector, Total Biomass

1949–1980: Commercial sector total biomass consumption is equal to commercial sector wood consumption.

1981–1988: Commercial sector total biomass consumption is the sum of the commercial sector consumption values for wood and fuel ethanol (minus denaturant).

1989 forward: Commercial sector total biomass consumption is the sum of the commercial sector consumption values for wood, waste, and fuel ethanol (minus denaturant).

Commercial Sector, Total Renewable Energy

1949–1988: Commercial sector total renewable energy consumption is equal to commercial sector total biomass consumption.

1989–2007: Commercial sector total renewable energy consumption is the sum of the commercial sector consumption values for conventional hydroelectric power, geothermal, and total biomass.

2008: Commercial sector total renewable energy consumption is the sum of the commercial sector consumption values for conventional hydroelectric power, geothermal, solar, and total biomass.

2009 forward: Commercial sector total renewable energy is the sum of the commercial sector consumption values for conventional hydroelectric power, geothermal, solar, wind, and total biomass.

Table 10.2b Sources

Industrial Sector, Hydroelectric Power

1949 forward: Industrial sector conventional hydroelectricity net generation data from Table 7.2c are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Industrial Sector, Geothermal

1989–2009: Annual estimates by the U.S. Energy Information Administration (EIA) based on data from Oregon Institute of Technology, Geo-Heat Center.

2010 forward: Annual estimates assumed by EIA to be equal to that of 2009.

(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

Industrial Sector, Solar

1989 forward: Industrial sector solar consumption is the sum of the values for "Small-Scale Solar Energy Consumption: Electricity, Industrial Sector" from Table 10.5 and "Utility-Scale Solar Energy Consumption: Electricity, Industrial Sector" from Table 10.6.

Industrial Sector, Wind

2011 forward: Industrial sector wind electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Industrial Sector, Wood

1949–1979: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981,* Table A2.

1980–1983: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption 1980–1983,* Table ES1.

1984: Annual estimate is from EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 1.

1985 and 1986: Annual estimates interpolated by EIA.

1987: Annual estimate is from EIA, *Estimates of Biofuels Consumption in the United States During 1987*, Table 2.

1988: Annual estimate interpolated by EIA.

(For 1973–1988, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

1989 forward: Monthly/annual industrial sector combined-heat-and-power (CHP) wood consumption data are from EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms. Annual estimates for industrial sector non-CHP wood consumption are based on EIA, Form EIA-846, "Manufacturing Energy Consumption Survey" (for 2019 forward, the annual estimates are assumed by EIA to be equal to that of 2018). For 1989 forward, monthly estimates for industrial sector non-CHP wood consumption are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month. Industrial sector total wood consumption is the sum of industrial sector CHP and non-CHP wood consumption.

Industrial Sector, Biomass Waste

1981: Annual estimate is calculated as total waste consumption (from EIA, *Estimates of U.S. Biofuels Consumption 199*0, Table 8) minus electric power sector waste consumption (from MER Table 10.2c).

1982 and 1983: Annual estimates are calculated as total waste consumption (based on *Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER, Table 10.2c).

1984: Annual estimate is calculated as total waste consumption (from EIA*, Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER, Table 10.2c).

1985 and 1986: Annual estimates interpolated by EIA.

1987: Annual estimate is calculated as total waste consumption (from EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER, Table 10.2c).

1988: Annual estimate interpolated by EIA.

(For 1973–1988, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

1989 forward: Monthly/annual industrial sector combined-heat-and-power (CHP) consumption data are from Table 7.4c. Annual estimates for industrial sector non-CHP waste consumption are based on information presented in Government Advisory Associates, *Resource Recovery Yearbook* and *Methane Recovery Yearbook,* and information provided by the U.S. Environmental Protection Agency, Landfill Methane Outreach Program (for 2014 forward, the annual estimates are assumed by EIA to be equal to that of 2013). For 1989 forward, monthly estimates for industrial sector non-CHP waste consumption are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month. Industrial sector total waste consumption is the sum of industrial sector CHP and non-CHP waste consumption.

Industrial Sector, Fuel Ethanol (Minus Denaturant)

1981 forward: The industrial sector share of motor gasoline consumption is equal to industrial sector motor gasoline consumption from Table 3.7b divided by motor gasoline product supplied from Table 3.5. Industrial sector fuel ethanol (minus denaturant) consumption is equal to fuel ethanol (minus denaturant) consumption from Table 10.3 multiplied by the industrial sector share of motor gasoline consumption. Note that there is a discontinuity in this time series between 2014 and 2015 due to a change in the method for allocating motor gasoline consumption to the end-use sectors; beginning in 2015, the commercial and industrial sector shares of fuel ethanol consumption are larger than in 2014, while the transportation sector share is smaller.

Industrial Sector, Biomass Losses and Co-products

1981 forward: Calculated as fuel ethanol losses and co-products from Table 10.3 plus biodiesel losses and co-products from Table 10.4a.

Industrial Sector, Total Biomass

1949–1980: Industrial sector total biomass consumption is equal to industrial sector wood consumption.

1981 forward: Industrial sector total biomass consumption is the sum of the industrial sector consumption values for wood, waste, fuel ethanol (minus denaturant), and biomass losses and co-products.

Industrial Sector, Total Renewable Energy

1949–1988: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power and total biomass.

1989–2009: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power, geothermal, and total biomass.

2010: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power, geothermal, solar, and total biomass.

2011 forward: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power, geothermal, solar, wind, and total biomass.

Table 10.2c Sources

Transportation Sector, Fuel Ethanol (Minus Denaturant)

1981 forward: The transportation sector share of motor gasoline consumption is equal to transportation sector motor gasoline consumption from Table 3.7c divided by motor gasoline product supplied from Table 3.5. Transportation sector fuel ethanol (minus denaturant) consumption is equal to fuel ethanol (minus denaturant) consumption from Table 10.3 multiplied by the transportation sector share of motor gasoline consumption. Note that there is a discontinuity in this time series between 2014 and 2015 due to a change in the method for allocating motor gasoline consumption to the end-use sectors; beginning in 2015, the commercial and industrial sector shares of fuel ethanol consumption are larger than in 2014, while the transportation sector share is smaller.

Transportation Sector, Biodiesel

2001 forward: Transportation sector biodiesel consumption is assumed to equal total biodiesel consumption from Table 10.4a.

Transportation Sector, Renewable Diesel Fuel

2011 forward: Transportation sector renewable diesel fuel consumption is assumed to equal total renewable diesel fuel consumption from Table 10.4b.

Transportation Sector, Other Biofuels

2014 forward: Transportation sector other biofuels consumption is assumed to equal total other biofuels consumption from Table 10.4c.

Transportation Sector, Total Renewable Energy

1981–2000: Transportation sector total renewable energy consumption is equal to transportation sector fuel ethanol (minus denaturant) consumption.

2001–2010: Transportation sector total renewable energy consumption is the sum of the transportation sector consumption values for fuel ethanol (minus denaturant) and biodiesel.

2011–2013: Transportation sector total renewable energy consumption is the sum of the transportation sector consumption values for fuel ethanol (minus denaturant), biodiesel, and renewable diesel fuel.

2014 forward: Transportation sector total renewable energy consumption is the sum of the transportation sector consumption values for fuel ethanol (minus denaturant), biodiesel, renewable diesel fuel, and other biofuels.

Electric Power Sector, Hydroelectric Power
1949 forward: Electric power sector conventional hydroelectricity net generation data from Table 7.2b are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Electric Power Sector, Geothermal
1960 forward: Electric power sector geothermal electricity net generation data from Table 7.2b are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Electric Power Sector, Solar
1984 forward: Electric power sector solar electricity net generation data from Table 7.2b are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Electric Power Sector, Wind
1983 forward: Electric power sector wind electricity net generation data from Table 7.2b are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Electric Power Sector, Wood
1949 forward: Table 7.4b.

Electric Power Sector, Biomass Waste
1970 forward: Table 7.4b.

Electric Power Sector, Total Biomass
1949–1969: Electric power sector total biomass consumption is equal to electric power sector wood consumption.

1970 forward: Electric power sector total biomass consumption is the sum of the electric power sector consumption values for wood and biomass waste.

Electric Power Sector, Total Renewable Energy
1949–1959: Electric power sector total renewable energy consumption is the sum of the electric power sector consumption values for hydroelectric power and total biomass.

1960–1982: Electric power sector total renewable energy consumption is the sum of the electric power sector consumption values for hydroelectric power, geothermal, and total biomass.

1983: Electric power sector total renewable energy consumption is the sum of the electric power sector consumption values for hydroelectric power, geothermal, wind, and total biomass.

1984 forward: Electric power sector total renewable energy consumption is the sum of the electric power sector consumption values for hydroelectric power, geothermal, solar, wind, and total biomass.

Table 10.3 Sources

Feedstock
1981 forward: Calculated as fuel ethanol production (in thousand barrels) minus denaturant, and then multiplied by the fuel ethanol feedstock factor—see Table A3.

Losses and Co-products
1981 forward: Calculated as fuel ethanol feedstock plus denaturant minus fuel ethanol production.

Denaturant
1981–2008: Data in thousand barrels for petroleum denaturant in fuel ethanol produced are estimated as 2% of fuel ethanol production; these data are converted to Btu by multiplying by 4.661 million Btu per barrel (the estimated quantity-weighted factor of natural gasoline and conventional motor gasoline used as denaturant).

2009–2020: U.S. Energy Information Administration (EIA), *Petroleum Supply Annual* (PSA), annual reports, Table 1. Data in thousand barrels for net production of natural gasoline at "renewable fuels and oxygenate plants" are multiplied by

-1; these data are converted to Btu by multiplying by 4.638 million Btu per barrel (the approximate heat content of natural gasoline). Data in thousand barrels for net production of conventional motor gasoline and motor gasoline blending components at "renewable fuels and oxygenate plants" are multiplied by -1; these data are converted to Btu by multiplying by 5.222 million Btu per barrel (the approximate heat content of motor gasoline blending components). Total denaturant is the sum of the values for natural gasoline, conventional motor gasoline, and motor gasoline blending components.

2021 and 2022: EIA, PSA, annual reports, Table 1. Data in thousand barrels for net production of natural gasoline at biofuels plants are multiplied by -1; these data are converted to Btu by multiplying by 4.638 million Btu per barrel (the approximate heat content of natural gasoline). Data in thousand barrels for net production of conventional motor gasoline and motor gasoline blending components at biofuels plants are multiplied by -1; these data are converted to Btu by multiplying by 5.222 million Btu per barrel (the approximate heat content of motor gasoline blending components). Total denaturant is the sum of the values for natural gasoline, conventional motor gasoline, and motor gasoline blending components.

2023: EIA, *Petroleum Supply Monthly* (PSM), monthly reports, Table 1. Data in thousand barrels for net production of natural gasoline at biofuels plants are multiplied by -1; these data are converted to Btu by multiplying by 4.638 million Btu per barrel (the approximate heat content of natural gasoline). Data in thousand barrels for net production of conventional motor gasoline and motor gasoline blending components at biofuels plants are multiplied by -1; these data are converted to Btu by multiplying by 5.222 million Btu per barrel (the approximate heat content of motor gasoline blending components). Total denaturant is the sum of the values for natural gasoline, conventional motor gasoline, and motor gasoline blending components.

Production

1981–1992: Fuel ethanol production is assumed to equal fuel ethanol consumption—see sources for "Consumption."

1993–2004: Calculated as fuel ethanol consumption plus fuel ethanol stock change minus fuel ethanol net imports. These data differ slightly from the original production data from EIA, Form EIA-819, "Monthly Oxygenate Report," and predecessor form, which were not reconciled and updated to be consistent with the final balance.

2005–2008: EIA, Form EIA-819, "Monthly Oxygenate Report."

2009–2020: EIA, PSA, annual reports, Table 1, data for net production of fuel ethanol at "renewable fuels and oxygenate plants."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for net production of fuel ethanol at biofuels plants.

2023: EIA, PSM, monthly reports, Table 1, data for net production of fuel ethanol at biofuels plants.

Trade, Stocks, and Stock Change

1992–2022: EIA, PSA, annual reports, Table 1.

2023: EIA, PSM, monthly reports, Table 1.

Consumption

1981–1989: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 10; and interpolated values for 1982, 1983, 1985, 1986, and 1988.

1990–1992: EIA, *Estimates of U.S. Biomass Energy Consumption 1992*, Table D2; and interpolated value for 1991.

1993–2004: EIA, PSA, annual reports, Tables 2 and 16. Calculated as 10% of oxygenated finished motor gasoline field production (Table 2), plus fuel ethanol refinery input (Table 16).

2005–2008: EIA, PSA, annual reports, Tables 1 and 15. Calculated as motor gasoline blending components adjustments (Table 1), plus finished motor gasoline adjustments (Table 1), plus fuel ethanol refinery and blender net inputs (Table 15).

2009–2022: EIA, PSA, annual reports, Table 1. Calculated as fuel ethanol refinery and blender net inputs minus fuel ethanol adjustments.

2023: EIA, PSM, monthly reports, Table 1. Calculated as fuel ethanol refinery and blender net inputs minus fuel ethanol adjustments.

Consumption Minus Denaturant

1981 forward: Calculated as fuel ethanol consumption minus the amount of denaturant in fuel ethanol consumed. Denaturant in fuel ethanol consumed is estimated by multiplying denaturant in fuel ethanol produced by the fuel ethanol consumption-to-production ratio.

Table 10.4a Sources

Biodiesel Feedstock

2001 forward: Calculated as biodiesel production in thousand barrels multiplied by 5.433 million Btu per barrel (the biodiesel feedstock factor—see "Biodiesel Feedstock" entry in the "Thermal Conversion Factor Source Documentation" at the end of Appendix A).

Biodiesel Losses and Co-products

2001 forward: Calculated as biodiesel feedstock minus biodiesel production.

Biodiesel Production

2001–2005: U.S. Department of Agriculture, Commodity Credit Corporation, Bioenergy Program records. Annual data are derived from quarterly data. Monthly data are estimated by dividing the annual data by the number of days in the year and then multiplying by the number of days in the month.

2006: U.S. Department of Commerce, U.S. Census Bureau, "M311K—Fats and Oils: Production, Consumption, and Stocks," data for soybean oil consumed in methyl esters (biodiesel). In addition, the U.S. Energy Information Administration (EIA) estimates that 14.4 million gallons of yellow grease were consumed in methyl esters (biodiesel).

2007: U.S. Department of Commerce, U.S. Census Bureau, "M311K—Fats and Oils: Production, Consumption, and Stocks," data for all fats and oils consumed in methyl esters (biodiesel).

2008: EIA, *Monthly Biodiesel Production Report*, December 2009 (release date October 2010), Table 11. Monthly data for 2008 are estimated based on U.S. Department of Commerce, U.S. Census Bureau, M311K data, multiplied by the EIA 2008 annual value's share of the M311K 2008 annual value.

2009 and 2010: EIA, *Monthly Biodiesel Production Report*, monthly reports, Table 1.

2011–2020: EIA, *Petroleum Supply Annual* (PSA), annual reports, Table 1, data for “renewable fuels except fuel ethanol.”

2021 and 2022: EIA, PSA, annual reports, Table 1, data for biodiesel.

2023: EIA, *Petroleum Supply Monthly* (PSM), monthly reports, Table 1, data for biodiesel.

Biodiesel Trade

2001–2011: For imports, U.S. Department of Agriculture, data for the following Harmonized Tariff Schedule codes: 3824.90.40.20, "Fatty Esters Animal/Vegetable Mixture" (data through June 2010); and 3824.90.40.30, "Biodiesel/Mixes" (data for July 2010–2011). For exports, U.S. Department of Agriculture, data for the following Schedule B codes: 3824.90.40.00, "Fatty Substances Animal/Vegetable/Mixture" (data through 2010); and 3824.90.40.30, "Biodiesel <70%" (data for 2011). (The data above are converted from pounds to gallons by dividing by 7.4.) Although these categories include products other than biodiesel (such as biodiesel coprocessed with petroleum feedstocks; and products destined for soaps, cosmetics, and other items), biodiesel is the largest component. In the absence of other reliable data for biodiesel trade, EIA sees these data as good substitutes.

2012–2018: EIA, PSA, annual reports, Tables 25 and 31, data for “biomass-based diesel fuel.”

2019–2020: EIA, PSA, annual reports, Tables 25 and 31, data for biodiesel.

2021 and 2022: EIA, PSA, annual reports, Table 1, data for biodiesel.

2023: EIA, PSM, monthly reports, Table 1, data for biodiesel.

Biodiesel Stocks and Stock Change

2009–2018: EIA, Form EIA-22M, "Monthly Biodiesel Production Survey," data for biodiesel; and Form EIA-810, "Monthly Refinery Report," Form EIA-812, "Monthly Product Pipeline Report," and Form EIA-815, "Monthly Bulk Terminal and Blender Report," data for "biomass-based diesel fuel."

2019–September 2020: EIA, Form EIA-22M, "Monthly Biodiesel Production Survey," Form EIA-810, "Monthly Refinery Report," and Form EIA-815, "Monthly Bulk Terminal and Blender Report," data for biodiesel.

October 2020–December 2020: EIA, Form EIA-810, "Monthly Refinery Report," Form EIA-815, "Monthly Bulk Terminal and Blender Report," and Form EIA-819, "Monthly Report of Biofuels, Fuels from Non-Biogenic Wastes, Fuel Oxygenates, Isooctane, and Isooctene," data for biodiesel.

2021 and 2022: EIA, PSA, annual reports, Table 1, data for biodiesel.

2023: EIA, PSM, monthly reports, Table 1, data for biodiesel.

Biodiesel Consumption

2001–2008: Calculated as biodiesel production plus biodiesel net imports.

January and February 2009: EIA, PSA, Table 1, data for refinery and blender net inputs of "renewable fuels except fuel ethanol."

March 2009 forward: Calculated as biodiesel production plus biodiesel net imports minus biodiesel stock change.

Table 10.4b Sources

Renewable Diesel Fuel Production

2011–2020: U.S. Environmental Protection Agency, "RINs Generated Transactions—Generation Summary Report," updated on September 10, 2021. Data are for volumes (in gallons); for "domestic" producer type; for fuel "non-ester renewable diesel."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for renewable diesel fuel.

2023: EIA, PSM, monthly reports, Table 1, data for renewable diesel fuel.

Renewable Diesel Fuel Trade (Imports)

2012–2020: EIA, PSA, annual reports, Table 25, data for "other renewable diesel fuel."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for renewable diesel fuel.

2023: EIA, PSM, monthly reports, Table 1, data for renewable diesel fuel.

Renewable Diesel Fuel Stocks and Stock Change

2011–2020: EIA, Form EIA-810, "Monthly Refinery Report," and Form EIA-815, "Monthly Bulk Terminal and Blender Report," data for "other renewable diesel fuel."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for renewable diesel fuel.

2023: EIA, PSM, monthly reports, Table 1, data for renewable diesel fuel.

Renewable Diesel Fuel Consumption

2011 forward: Calculated as renewable diesel fuel production plus renewable diesel fuel imports minus renewable diesel fuel stock change.

Table 10.4c Sources

Other Biofuels Production

2011–2020: U.S. Environmental Protection Agency, "RINs Generated Transactions—Generation Summary Report," updated on September 10, 2021. Data are for volumes (in gallons); for "domestic" producer type; for fuels "renewable heating oil," "renewable jet fuel," "naphtha," "LPG," "butanol," "cellulosic diesel," and "cellulosic renewable gasoline blendstock."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for other biofuels.

2023: EIA, PSM, monthly reports, Table 1, data for other biofuels.

Other Biofuels Trade (Imports)

2012–2020: EIA, PSA, annual reports, Table 25, data for "other renewable fuels."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for other biofuels.

2023: EIA, PSM, monthly reports, Table 1, data for other biofuels.

Other Biofuels Stocks and Stock Change

2011–2020: EIA, Form EIA-810, "Monthly Refinery Report," and Form EIA-815, "Monthly Bulk Terminal and Blender Report," data for "other renewable fuels."

2021 and 2022: EIA, PSA, annual reports, Table 1, data for other biofuels.

2023: EIA, PSM, monthly reports, Table 1, data for other biofuels.

Other Biofuels Consumption

2014 forward: Calculated as other biofuels production plus other biofuels imports minus other biofuels stock change.

Table 10.5 Sources

Small-Scale Solar Energy Consumption: Heat

Annual Data

1989–2009: Annual estimates by the U.S. Energy Information Administration (EIA) based on EIA, Form EIA-63A, "Annual Solar Thermal Collector/Reflector Shipments Report." Solar energy consumption by solar thermal non-electric applications (mainly in the residential sector, but with some in the commercial and industrial sectors) is based on assumptions about the stock of equipment in place and other factors.

2010 forward: Annual estimates based on commercial sector solar thermal growth rates from EIA's *Annual Energy Outlook* (AEO) data system.

Monthly Data

1989–2013: Monthly estimates for each year are obtained by allocating a given year's annual value to the months in that year. Each month's allocator is the average of that month's "Small-Scale Solar Energy Consumption: Electricity, Total" values in 2014 and 2015. The allocators, when rounded, are as follows: January—5%; February—6%; March—8%; April—9%; May—10%; June—10%; July—10%; August—10%; September—9%; October—9%; November—7%; and December—7%.

2014 forward: Once all 12 months of "Small-Scale Solar Energy Consumption: Electricity, Total" data are available for a given year, they are used as allocators and applied to the annual estimate in order to derive monthly estimates for that year. Initial monthly estimates for the current year use the previous year's allocators.

Small-Scale Solar Energy Consumption: Electricity, Residential Sector

Beginning in 2014, monthly and annual data for residential sector small-scale solar photovoltaic generation are from EIA, *Electric Power Monthly*, Table 1.2.E. Those data are converted to consumption data in Btu by multiplying by the electricity heat content factor in MER Table A6.

Backcasts for earlier periods are developed as follows:

Annual Data

1989–2003: Annual growth rates are calculated based on small-scale solar electricity consumption in all sectors. Consumption is estimated using information on shipments of solar panels from EIA, Form EIA-63B, "Annual Photovoltaic Cell/Module Shipments Report," and assumptions about the stock of equipment in place and other factors. The growth rates are applied to more recent data to create historical annual estimates.

2004–2008: Annual growth rates based on commercial sector solar photovoltaic growth rates from EIA's *Annual Energy Outlook* (AEO) data system are applied to more recent data to create historical annual estimates.

2009–2013: Annual growth rates based on residential sector solar photovoltaic growth rates from EIA's *Annual Energy Outlook* (AEO) data system are applied to more recent data to create historical annual estimates.

Monthly Data

1989–2013: See "Small-Scale Solar Energy Consumption: Heat, Monthly Data."

Small-Scale Solar Energy Consumption: Electricity, Commercial Sector

Beginning in 2014, monthly and annual data for commercial sector small-scale solar photovoltaic generation are from EIA, *Electric Power Monthly*, Table 1.2.C. Those data are converted to consumption data in Btu by multiplying by the electricity heat content factor in MER Table A6.

Backcasts for earlier periods are developed as follows:

Annual Data

1989–2003: Annual growth rates based on EIA, Form EIA-63B, "Annual Photovoltaic Cell/Module Shipments Report," are applied to more recent data to create historical annual estimates. (See "Small-Scale Solar Energy Consumption: Electricity, Residential Sector" sources above for details.)

2004–2013: Annual growth rates based on commercial sector solar photovoltaic growth rates from EIA's *Annual Energy Outlook* (AEO) data system are applied to more recent data to create historical annual estimates.

Monthly Data

1989–2013: See "Small-Scale Solar Energy Consumption: Heat, Monthly Data."

Small-Scale Solar Energy Consumption: Electricity, Industrial Sector

Beginning in 2014, monthly and annual data for industrial sector small-scale solar photovoltaic generation are from EIA, *Electric Power Monthly*, Table 1.2.D. Those data are converted to consumption data in Btu by multiplying by the electricity heat content factor in MER Table A6.

Backcasts for earlier periods are developed as follows:

Annual Data

1989–2003: Annual growth rates based on EIA, Form EIA-63B, "Annual Photovoltaic Cell/Module Shipments Report," are applied to more recent data to create historical annual estimates. (See "Small-Scale Solar Energy Consumption: Electricity, Residential Sector" sources above for details.)

2004–2013: Annual growth rates based on commercial sector solar photovoltaic growth rates from EIA's *Annual Energy Outlook* (AEO) data system are applied to more recent data to create historical annual estimates.

Monthly Data

1989–2013: See "Small-Scale Solar Energy Consumption: Heat, Monthly Data."

Small-Scale Solar Energy Consumption: Electricity, Total
1989 forward: Small-scale solar energy consumption for total electricity is the sum of the small-scale solar energy consumption (for electricity) values for the residential, commercial, and industrial sectors.

Small-Scale Solar Energy Consumption: Total
1989 forward: Small-scale solar energy consumption total is the sum of small-scale solar energy consumption values for heat and total electricity.

Utility-Scale Solar Energy Consumption: Electricity, Commercial Sector
2008 forward: Commercial sector solar photovoltaic and solar thermal electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Utility-Scale Solar Energy Consumption: Electricity, Industrial Sector
2010 forward: Industrial sector solar photovoltaic and solar thermal electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the electricity heat content factor in Table A6.

Utility-Scale Solar Energy Consumption: Electricity, Electric Power Sector
1984 forward: Electric power sector solar photovoltaic and solar thermal electricity net generation data from Table 7.2b are converted to Btu by multiplying the electricity heat content factor in Table A6.

Utility-Scale Solar Energy Consumption: Electricity, Total
1984 forward: Utility-scale solar energy consumption for total electricity is the sum of the utility-scale solar energy consumption (for electricity) values for the commercial, industrial, and electric power sectors.

Solar Energy Consumption: Total
1984 forward: Total solar energy consumption is the sum of the values for total small-scale solar energy consumption and total utility-scale solar energy consumption.