

Section 7. Consumption Adjustments for Calculating Expenditures

Expenditures developed in the EIA State Energy Data System (SEDS) are calculated by multiplying the price estimates by the SEDS consumption estimates. The consumption estimates are adjusted to remove process fuel, intermediate petroleum products, electricity exports, and other consumption that has no direct fuel costs, i.e., hydroelectric, geothermal, solar, and wind energy sources, and some wood and waste.

Almost all aspects of energy production, processing, and distribution consume energy as an inherent part of those activities. SEDS industrial and transportation sector consumption estimates include energy consumed in the process of providing energy to the end-use consumer and are called “process fuel.” Familiar examples include energy sources used in drilling for oil and gas and transporting natural gas and petroleum by pipeline. Another “process fuel” is the energy used in generating and delivering electricity to end users. Energy products that are subsequently incorporated into another energy product for end-use consumption are called “intermediate products.” Motor gasoline blending components are familiar examples of intermediate products that are consumed as part of the finished motor gasoline sold at service stations and other outlets.

Process fuel and intermediate products are not purchased by the end user and, therefore, do not have prices. Although the end user does not consume either process fuel or intermediate products directly, he does pay for them, because the cost to the processor or distributor is passed on to the end user in the price of the final end-user product. If their use was left in the consumption estimates and was assigned prices, the expenditures would be counted twice, first as paid by the “processor” (producer, processor, or transporter) and again as included in the price to the end user.

Some renewable energy sources are not purchased. These include hydroelectric, geothermal, wind, photovoltaic, and solar thermal energy. The consumption of these sources, which are measured in SEDS as kilowatthours of electricity produced, are not included in the state energy expenditure estimates since there are no “fuel costs” involved. Wood and waste can be purchased or obtained at no cost. Wood consumption estimates in the residential sector, and wood and waste in the commercial and industrial sectors are adjusted in SEDS to remove estimated quantities that were obtained at no cost.

To estimate energy expenditures in the price and expenditure tables, the

consumption of process fuel, intermediate products, and some of the renewable energy sources are subtracted from the end-use sector in which they are included in SEDS, either the residential, commercial, industrial, or transportation sector, and there are no prices associated with them.

Process fuel consumption adjustments include:

1. Fuel (petroleum, natural gas, steam coal) and electricity consumed at refineries
2. Crude oil lease, plant, and pipeline fuel
3. Natural gas lease and plant fuel
4. Natural gas pipeline and distribution fuel
5. Electrical system energy losses (i.e., energy consumed in the generation, transmission, and distribution of electricity)
6. Energy losses and co-products from the production of fuel ethanol

Intermediate product consumption adjustments include:

1. Aviation gasoline blending components
2. Motor gasoline blending components
3. Natural gasoline (1970 through 1983)
4. Natural gasoline, formerly pentanes plus (1984 through 2009)
5. Plant condensate (1970 through 1983)
6. Unfinished oils
7. Unfractionated streams (1970 through 1983)

Starting in 1984, historical natural gasoline (including isopentane) and plant condensate are reported together as the new product, pentanes plus. In the 2016 cycle of SEDS, the product is renamed natural gasoline and is grouped under hydrocarbon gas liquids (HGL). For 2010 forward, price for natural gasoline consumed by the petrochemical industry is incorporated into the composite price for HGL. Before 2010, natural gasoline is assumed to be an intermediate product.

Renewable energy consumption adjustments include:

1. Solar energy in the residential, commercial, industrial, and electric power sectors;

2. Geothermal energy in the residential, commercial, industrial, and electric power sectors;
3. Electricity generated from hydropower in the commercial, industrial, and electric power sectors; and
4. Electricity generated from wind energy in the commercial, industrial, and electric power sectors; and
5. Estimated portions of wood consumed in the residential sector, and wood and waste in the commercial and industrial sectors that were obtained at no cost.

In addition, while consumption of supplemental gaseous fuels (SGF) are removed from SEDS total consumption estimates to prevent double-counting in both natural gas and the fossil fuels from which they are derived, prices and expenditures of SGF cannot be separately identified and are therefore not adjusted for double-counting in total energy average prices and total energy expenditure calculations.

Table TN7.1 shows the quantities of energy, by state, removed from SEDS consumption to calculate expenditures for 2016. Table TN7.2 shows the adjustments made to SEDS national consumption estimates for 1970 through 2016 to derive the net consumption data used to calculate expenditures.

State adjustment estimates from 1970 forward are available in the SEDS Internet data file, http://www.eia.gov/state/seds/sep_update/pr_adjust_consum_update.csv.

Adjustment procedures

Hydroelectricity, geothermal, solar, and wind energy. Electricity generated from hydropower and geothermal, solar, and wind energy has no fuel cost. Operation and maintenance costs associated with these energy sources are included indirectly in the prices of the electricity sold by power producers. Therefore, use of these renewable sources for electricity generation is removed from the expenditure calculations. Direct use of geothermal and solar energy also has no fuel cost and is omitted from SEDS energy expenditure calculations.

Residential wood. Some residential wood is purchased and some acquired at no cost. Based on responses to the Form EIA-457, "1980 Residential Energy Consumption Survey," Census division percentages of wood purchased were developed and applied to the residential wood consumption in each state in the divisions in 1970 through 1989. Based on responses to the Form EIA-457, "1993 Residential Energy Consumption Survey," Census region percentages

were developed and applied to the residential wood consumption of the states in each region in 1990 forward. Table TN7.3 shows the percentage of purchased wood for each Census division or region.

Commercial wood and waste. Some commercial wood and waste is purchased and some acquired at no cost. Conventional commercial wood purchased was estimated using the same percentages used for the residential sector (see Table TN7.3). Wood and waste acquired at no cost by commercial combined heat-and-power facilities for 1989 through 2011 was estimated using the U.S. annual average percentages of wood and percentages of waste acquired at no cost by the electric power sector. For 2012 forward, because of lack of information, these percentages are no longer estimated and are assumed to be zero.

Industrial wood and waste. The cost of wood and waste products used for energy vary widely from more expensive woods to free industrial waste products. Industrial consumption is broken into two segments, manufacturing industries and combined heat and power (CHP) facilities in order to estimate quantities received at no cost.

Adjustments to manufacturing wood and waste consumption in 1994 forward are based on information gathered on the Form EIA-846, "1994 Manufacturing Energy Survey (MECS)." Adjustments to manufacturing consumption in 1980 through 1993 are based on information gathered on the Form EIA-846, "1991 Manufacturing Energy Survey." Adjustments to industrial wood and waste consumption in 1970 through 1979 are based on the 1980 average ratios for each state. The 1991 and 1994 MECS report the quantities consumed and quantities purchased of five types of wood and waste in each of four (MECS 1991) or five (MECS 1994) SIC categories of industries. The two quantity series are used to calculate SIC category average percentages of wood and waste obtained at no cost. These percentages are applied to the estimated consumption in those SIC categories in each state to estimate the state's manufacturing uncosted wood and waste.

Estimates of wood and waste obtained at no charge by industrial CHP facilities for 1989 through 2011 are estimated using the U.S. annual average percentages of wood and percentages of waste acquired at no cost by the electric power sector. For 2012 forward, because of lack of information, these percentages are no longer estimated and are assumed to be zero.

Each state's industrial wood and waste consumption quantities acquired at no cost are the sum of the estimated manufacturing and CHP facilities' quantities for each year.

Refinery fuel. Petroleum refinery consumption of distillate fuel, residual fuel, hydrocarbon gas liquids (mainly propane), petroleum coke, still gas, natural

Table TN7.1. Energy consumption adjustments for calculating expenditures by state, 2016 (billion Btu)

State	Refinery Fuel and Intermediate Products								Total
	Distillate Fuel Oil	Residual Fuel Oil	Hydrocarbon gas liquids ^a	Petroleum Coke	Other Petroleum ^b	Natural Gas ^c	Coal	Electricity ^d	
AK	69	—	—	—	13,255	3,421	—	208	16,953
AL	6	—	35	—	10,984	9,593	—	1,201	21,818
AR	6	—	23	1,584	7,549	6,504	—	826	16,492
AZ	—	—	—	—	—	—	—	—	—
CA	865	358	1,316	60,141	159,006	152,506	—	9,421	383,613
CO	—	—	23	3,043	8,592	5,277	—	1,095	18,030
CT	—	—	—	—	—	—	—	—	—
DC	—	—	—	—	—	—	—	—	—
DE	—	—	—	8,909	15,198	10,260	69	969	35,405
FL	—	—	—	—	—	—	—	—	—
GA	—	—	—	—	—	—	—	—	—
HI	69	1,176	—	2,150	12,304	—	—	194	15,893
IA	—	—	—	—	—	—	—	—	—
ID	—	—	—	—	—	—	—	—	—
IL	52	44	3,099	32,780	80,041	33,784	—	10,833	160,634
IN	23	19	219	14,724	36,845	15,448	—	5,036	72,314
KS	17	19	180	8,085	30,113	20,658	—	4,279	63,351
KY	17	—	138	8,041	23,231	9,678	—	3,177	44,283
LA	138	6	917	95,952	278,878	134,884	—	32,506	543,281
MA	—	—	—	—	—	—	—	—	—
MD	—	—	—	—	—	—	—	—	—
ME	—	—	—	—	—	—	—	—	—
MI	6	6	65	3,093	11,011	4,647	—	1,505	20,334
MN	23	—	192	9,280	32,408	13,577	—	4,432	59,912
MO	—	—	—	—	—	—	—	—	—
MS	17	—	104	6,639	31,490	27,526	—	3,439	69,215
MT	6	—	—	6,557	17,109	9,093	—	3,177	35,941
NC	—	—	—	—	—	—	—	—	—
ND	6	—	46	2,364	7,783	3,426	—	1,065	14,689
NE	—	—	—	—	—	—	—	—	—
NH	—	—	—	—	—	—	—	—	—
NJ	—	—	—	20,709	39,623	26,553	—	2,525	89,410
NM	6	—	35	2,905	10,302	9,150	—	1,126	23,523
NV	—	—	4	—	167	45	—	3	219
NY	—	—	—	—	—	—	—	—	—
OH	29	25	292	17,390	48,632	19,901	—	6,125	92,393
OK	29	25	253	10,644	42,651	30,147	—	5,353	89,102
OR	—	—	—	—	—	—	—	—	—
PA	—	—	—	22,419	48,048	16,622	210	5,132	92,431
RI	—	—	—	—	—	—	—	—	—
SC	—	—	—	—	—	—	—	—	—
SD	—	—	—	—	—	—	—	—	—
TN	12	6	96	5,413	15,849	6,662	—	2,167	30,205
TX	640	13	1,542	171,597	469,549	287,210	—	46,407	976,958
UT	6	—	42	5,665	16,419	7,668	—	1,426	31,225
VA	—	—	—	—	—	—	—	—	—
VT	—	—	—	—	—	—	—	—	—
WA	288	—	901	14,554	52,861	36,657	—	5,626	110,889
WI	—	—	19	849	3,170	1,342	—	433	5,813
WV	—	—	—	—	1,860	1,312	—	119	3,291
WY	6	—	38	5,394	14,806	9,236	—	1,890	31,371
US	2,336	1,697	9,578	540,883	1,539,733	912,787	279	161,695	3,168,989

See footnotes at end of table.

Table TN7.1. Energy consumption adjustments for calculating expenditures by state, 2016 (billion Btu) (continued)

State	Residential		Commercial		Industrial					Transportation	Electrical System Energy Losses	Total
	Non-combustible Renewable Energy ^e	Wood	Non-combustible Renewable Energy ^e	Wood and Waste	Crude Oil Lease, Plant, and Pipeline Fuel	Natural Gas Lease and Plant Fuel	Non-combustible Renewable Energy ^e	Wood and Waste	Ethanol Production Losses ^f	Natural Gas Pipeline Fuel		
AK	111	861	1,641	194	—	264,148	—	57	—	458	36,965	321,389
AL	191	2,813	48	634	—	17,243	42	25,037	—	21,655	538,425	627,907
AR	898	4,044	28	912	—	5,408	12	11,533	—	8,373	301,389	349,088
AZ	12,153	1,150	4,600	259	—	3	1,820	129	2,644	15,195	512,332	550,285
CA	65,303	14,962	17,651	3,373	—	42,615	14,079	8,545	11,568	23,254	1,575,419	2,160,381
CO	2,998	3,736	2,275	842	—	120,188	319	192	6,707	8,120	382,636	546,042
CT	2,556	1,610	1,198	363	—	—	146	3,465	—	4,465	173,052	186,854
DC	176	10	141	2	—	—	—	—	—	941	84,240	85,509
DE	835	548	283	123	—	—	34	15	—	999	66,407	104,648
FL	35,277	6,157	2,879	1,388	—	272	53	8,341	—	19,194	1,389,286	1,462,847
GA	744	5,134	287	1,157	—	—	1,569	21,562	6,350	7,027	906,612	950,443
HI	6,351	137	2,583	31	—	—	370	12	—	2	59,560	84,940
IA	763	2,623	1,117	591	—	—	24	9,580	207,665	9,465	343,216	575,045
ID	214	1,549	642	349	—	52	760	572	3,173	5,803	151,025	164,140
IL	3,373	6,638	276	1,496	—	696	2	4,024	83,934	24,540	1,055,455	1,341,068
IN	4,057	5,744	890	1,295	—	410	9	9,660	61,601	9,448	801,530	966,958
KS	384	2,141	695	483	—	16,714	—	94	26,445	20,242	305,133	435,683
KY	1,996	5,916	972	1,334	—	6,213	—	5,415	1,901	9,396	570,050	647,476
LA	2,736	995	914	224	—	160,094	42	16,331	—	63,040	520,744	1,308,401
MA	4,162	2,786	8,246	628	—	—	608	5,581	—	10,179	348,702	380,891
MD	3,543	4,213	1,675	950	—	—	321	920	—	7,817	466,782	486,221
ME	392	3,902	95	880	—	—	2,972	11,100	—	681	54,492	74,513
MI	5,023	8,845	1,154	1,994	—	6,942	243	19,550	14,498	17,079	706,830	802,491
MN	1,443	6,644	421	1,498	—	—	1,227	10,917	62,099	12,062	421,683	577,905
MO	1,076	12,384	857	2,792	—	—	9	1,577	13,537	6,951	584,078	623,260
MS	207	2,326	781	524	—	3,194	43	5,005	2,856	22,407	257,796	364,354
MT	202	1,276	174	288	—	3,533	70	390	—	4,769	100,597	147,241
NC	1,697	7,099	2,320	1,601	—	—	39	12,572	—	2,693	892,339	920,360
ND	540	218	445	49	—	25,166	—	965	24,744	16,283	134,152	217,250
NE	536	1,228	728	277	—	106	1	323	105,778	6,725	222,430	338,132
NH	428	2,255	127	508	—	—	18	1,565	—	84	75,073	80,060
NJ	6,719	2,994	8,803	675	—	—	837	2,412	—	7,586	471,301	590,737
NM	1,100	2,771	688	625	—	88,122	250	82	—	9,051	159,365	285,577
NV	3,702	723	2,239	163	—	3	648	78	—	4,051	188,517	200,343
NY	6,771	5,282	3,717	1,191	—	222	660	11,511	8,937	31,069	882,993	952,352
OH	3,047	10,064	1,653	2,269	—	14,051	543	9,673	28,097	22,817	1,061,665	1,246,272
OK	81	2,323	7	524	—	99,722	—	6,347	—	52,428	385,251	635,784
OR	2,345	6,385	1,330	1,440	—	58	286	8,945	2,217	5,161	273,106	301,272
PA	3,070	6,582	1,953	1,484	—	200,636	631	24,415	5,817	47,456	984,320	1,368,795
RI	225	382	207	86	—	—	—	34	—	3,030	39,257	43,221
SC	903	1,653	113	373	—	—	14	18,551	—	2,861	592,798	617,266
SD	658	792	970	178	—	603	251	629	55,150	6,761	82,155	148,147
TN	446	3,235	609	729	—	305	6	12,927	11,898	9,812	753,406	823,578
TX	4,488	5,154	2,639	1,162	—	431,660	—	9,751	20,562	90,011	2,599,853	4,142,238
UT	1,082	418	748	94	—	27,947	417	100	—	13,001	197,729	272,762
VA	1,568	6,820	1,030	1,538	—	7,619	84	7,161	1,322	8,514	765,221	800,876
VT	593	2,333	221	526	—	—	3	184	—	138	7,627	11,624
WA	1,183	7,040	899	1,587	—	—	2	12,839	—	12,907	565,947	713,293
WI	997	9,655	128	2,177	—	—	1,733	26,844	28,397	3,868	492,212	571,823
WV	119	7,560	16	1,704	—	68,368	4,576	574	—	22,328	221,196	329,734
WY	89	452	539	102	—	33,328	68	57	—	13,966	122,211	202,184
US	199,550	202,565	84,653	45,668	—	1,645,641	35,839	348,140	797,895	726,162	24,884,559	32,139,662

^a Propane consumed as refinery fuel.

^b In this table, "other petroleum" consists of: still gas consumed as refinery fuel; and aviation gasoline blending components and motor gasoline blending components used as intermediate products.

^c Natural gas including supplemental gaseous fuels.

^d Electricity is converted at the rate of 3,412 Btu per kilowatthour.

^e Hydroelectric power, geothermal, solar, and wind energy. Solar thermal energy consumed as heat by the commercial and industrial sectors that cannot be separately identified are included in residential consumption.

^f Energy losses and co-products from the production of fuel ethanol without denaturant.

— = No consumption. NA = Not available.

Source: EIA, State Energy Data System.

Table TN7.2. Energy consumption adjustments for calculating expenditures, selected years, 1970 through 2016 (trillion Btu)

Year	Total (Gross) Consumption	Adjustments													Consumption used in Expenditure Calculations ^c
		Residential		Commercial		Industrial						Transportation	Electrical System Energy Losses	Total	
		Non-combustible Renewable Energy ^a	Wood	Non-combustible Renewable Energy ^a	Wood and Waste	Refinery Fuel and Intermediate Products	Crude Oil Lease, Plant, and Pipeline Fuel	Natural Gas Lease and Plant Fuel	Non-combustible Renewable Energy ^a	Wood and Waste	Ethanol Production Losses ^b	Natural Gas Pipeline Fuel			
1970	67,742	—	298	—	6	2,714	—	1,442	34	789	—	740	11,497	17,521	50,221
1975	71,987	—	316	—	6	2,883	—	1,434	32	824	—	595	14,304	20,394	51,593
1976	76,002	—	357	—	7	2,906	—	1,679	33	944	—	559	15,154	21,640	54,363
1977	77,988	—	402	—	8	3,007	—	1,706	33	991	—	544	15,898	22,588	55,400
1978	80,022	—	462	—	9	2,937	—	1,694	32	1,083	—	541	16,680	23,438	56,584
1979	80,882	—	543	—	10	3,077	—	1,534	34	1,087	—	613	16,879	23,776	57,106
1980	78,093	—	627	—	16	3,052	—	1,058	33	1,283	—	650	17,178	23,897	54,347
1981	76,142	—	651	—	16	2,203	—	959	33	1,354	6	660	17,161	23,043	53,272
1982	73,059	—	724	—	16	2,088	—	1,144	33	1,310	16	614	16,835	22,780	50,423
1983	72,934	—	722	—	16	2,121	140	1,010	33	1,480	29	505	17,262	23,319	49,746
1984	76,571	—	733	—	16	2,254	135	1,113	33	1,510	35	545	17,790	24,165	52,515
1985	76,464	—	755	—	18	2,045	128	1,001	33	1,503	42	521	18,164	24,211	52,378
1986	76,639	—	688	—	20	2,285	103	954	33	1,478	48	501	18,135	24,247	52,506
1987	79,006	—	634	—	22	2,485	72	1,194	33	1,472	55	538	18,558	25,063	54,041
1988	82,760	—	676	—	24	2,696	85	1,134	33	1,531	55	633	19,478	26,346	56,514
1989	84,776	57	684	3	73	2,710	59	1,103	30	684	56	650	20,850	26,958	57,923
1990	84,506	60	337	4	59	2,802	51	1,269	33	716	49	682	21,255	27,318	57,306
1991	84,435	62	353	5	60	2,668	39	1,164	32	685	56	621	21,444	27,189	57,352
1992	85,788	65	371	5	66	2,954	27	1,208	33	689	64	608	21,309	27,398	58,502
1993	87,393	67	308	5	68	2,877	21	1,199	32	642	74	643	22,097	28,033	59,474
1994	89,114	68	292	5	66	2,991	19	1,153	65	662	82	706	22,400	28,510	60,709
1995	91,093	69	292	6	66	2,914	15	1,253	58	445	86	723	23,214	29,140	62,058
1996	94,090	70	303	7	77	3,203	14	1,280	64	495	61	734	23,916	30,225	63,970
1997	94,748	70	233	7	80	3,196	5	1,251	61	493	80	781	24,167	30,424	64,423
1998	95,030	69	207	9	71	3,042	—	1,212	58	493	86	657	25,102	31,007	64,119
1999	96,628	69	213	9	66	3,050	—	1,103	53	495	90	663	25,689	31,499	65,223
2000	98,808	66	229	9	67	2,950	—	1,181	47	459	99	661	26,405	32,173	66,720
2001	96,144	65	210	10	46	3,152	—	1,139	37	437	108	641	25,663	31,507	64,717
2002	97,648	R 63	213	10	43	3,027	—	1,135	44	312	130	683	26,210	31,871	65,842
2003	97,916	65	225	13	46	3,141	—	1,147	46	316	168	609	26,111	31,887	66,095
2004	100,098	65	230	14	46	3,123	—	1,123	37	537	201	582	26,601	32,558	67,597
2005	100,184	66	249	16	49	3,130	—	1,138	37	336	227	601	27,144	32,994	67,249
2006	99,447	71	221	17	46	3,210	—	1,171	34	278	280	602	26,902	32,832	66,677
2007	100,991	77	244	19	46	3,180	—	1,257	21	293	368	640	27,536	33,681	67,383
2008	98,862	85	273	21	47	2,983	—	1,250	23	282	518	667	27,239	33,388	65,557
2009	94,094	93	292	25	48	2,922	—	1,304	24	457	602	689	25,809	32,265	61,917
2010	R 97,544	R 102	255	31	45	R 2,972	—	1,316	23	R 392	726	692	26,826	R 33,379	R 64,256
2011	R 96,898	110	261	40	45	R 3,052	—	1,355	26	R 370	754	705	26,516	R 33,235	R 63,750
2012	R 94,455	R 118	244	52	34	R 3,105	—	1,433	34	R 357	709	751	25,545	R 32,382	R 62,161
2013	R 97,223	131	336	62	40	R 3,175	—	1,522	46	R 361	707	857	25,665	R 32,902	R 64,374
2014	R 98,392	R 149	R 340	74	R 42	R 3,070	—	1,562	28	R 353	755	726	25,803	R 32,900	R 65,549
2015	R 97,411	R 167	R 253	78	R 44	R 3,057	—	R 1,633	32	R 352	774	R 707	25,076	R 32,171	R 65,296
2016	97,315	200	203	85	46	3,169	—	1,646	36	348	798	726	24,885	32,140	65,228

^a Hydroelectric power, geothermal, solar, and wind energy. Solar thermal energy consumed as heat by the commercial and industrial sectors that cannot be separately identified are included in residential consumption.

^b Energy losses and co-products from the production of fuel ethanol without denaturant.

^c Includes adjustments of supplemental gaseous fuels and processed fuels not shown on this table.

Where shown, R = Revised data and — = No consumption.

NA = Not available.

Note: Totals may not equal sum of components due to independent rounding. All data are available via the full-precision data file (CSV) at <http://www.eia.gov/state/seds/seds-data-fuel.php?sid=US>.

Sources: EIA, State Energy Data System.

Table TN7.3. Percentage of purchased wood in residential wood consumption

1960–1989		1990 forward	
Census Division	Percent	Census Region	Percent
New England	40%	Northeast	61%
Middle Atlantic	29%	Midwest	32%
East North Central	18%	South	39%
West North Central	17%	West	42%
South Atlantic	30%		
East South Central	18%		
West South Central	38%		
Mountain	12%		
Pacific	31%		

gas, steam coal, and electricity is estimated for each state and subtracted from the state’s industrial sector total of each energy source.

Estimation of petroleum coke consumed by the refineries is described in Section 4 of the SEDS Consumption Technical Notes at <http://www.eia.gov/state/seds/seds-technical-notes-complete.php>.

Refinery consumption of still gas, excluding still gas consumed as petrochemical feedstocks, is subtracted from the SEDS industrial sector total for 1970 through 1985. Beginning in 1986, EIA data series no longer report refinery fuel and feedstock use separately, and all industrial still gas consumption is removed. Estimation of still gas consumption is described in Section 4 of the SEDS Consumption Technical Notes at <http://www.eia.gov/state/seds/seds-technical-notes-complete.php>.

Refinery consumption of each of the other fuels is available in the data sources by state or group of states (1970 through 1980) and by Petroleum Administration for Defense (PAD) district (1981 forward). For 2013 forward, SEDS incorporates unpublished state-level refinery fuel consumption data that satisfied two statistical disclosure rules—that there are at least three refineries not of the same company in the state and that no one refinery uses more than 60% of the particular fuel. The number of states with usable data varies by fuel, from zero for coal and residual fuel oil to over 10 for electricity.

For each fuel, consumption for all the usable states within each PAD district is subtracted from the district’s fuel consumption. This remainder is then allocated to the other states in the district according to their operable refining capacities. To reduce the possibility of over-allocating refinery fuel use to states that do not consume much of the fuel, states where industrial sector consumption of a specific fuel is less than 0.05% (for natural gas, electricity,

distillate fuel oil, and propane) or 0.1% (for coal and residual fuel oil) of the U.S. industrial sector total consumption are not included in the allocation.

Prior to 2013, state-level refinery consumption of each of the other fuels is estimated by allocating the regional data (for state groups before 1981 and PAD district for 1981 through 2012) to the states with operating refineries according to their shares of the region’s industrial sector consumption of the fuel.

In some cases, the estimated state refinery fuel consumption of residual fuel or propane exceeds the estimate of the total industrial sector consumption of that fuel for that state. For 1970 through 2006, the refinery fuel consumption for the PAD district, group of states, or individual state is reduced until each state has positive industrial consumption. The excess refinery fuel is reallocated to a different PAD district, group of states, or individual state as shown in Table TN7.4. When this adjustment involves a PAD district or group value, the refineries’ consumption estimates for all states within the PAD district or group are recalculated using these new values. From 2007 forward, this adjustment is no longer made.

Refinery consumption of coal is withheld in the data source for 1999 and 2000 and unpublished estimates developed by the data source office are used for 1999 and 2000. For 2001 and 2002, the U.S. values for refinery consumption of coal are published although the PAD district values are withheld. The PAD district values for 2001 and 2002 are estimated by applying the PAD districts’ percentages of the U.S. total in 2000 to the U.S. totals for 2001 and 2002.

Because crude oil consumption is not an individual fuel in SEDS for 1970 through 1980, the small amounts of crude oil that were used at refineries during those years were allocated to residual and distillate fuels consumed at refineries. The allocation from crude oil refinery use to residual and distillate fuels refinery use was made according to each fuel’s share of the total crude oil used directly (including losses) as residual and distillate fuels from the EIA *Petroleum Supply Annual, Volume 1*, of each year, Table 2.

Intermediate products. Aviation gasoline blending components, motor gasoline blending components, natural gasoline (1970 through 1983), plant condensate (1970 through 1983), unfinished oils, and unfractionated streams (1970 through 1983) are used at refineries and blending plants to make end-use petroleum products, particularly motor gasoline. Accordingly, consumption of these products is completely removed. Through 2009, natural gasoline (formerly pentanes plus) is assumed to be used as intermediate product and its consumption is removed in the calculation of expenditures.

Crude oil lease, plant, and pipeline fuel. Industrial crude oil is assumed to be used as lease, plant, and pipeline fuel. Because these are process fuel uses,

Table TN7.4. Reallocations of excess refinery fuel consumption, 1970 through 2005

Year	Fuel	Thousand Barrels	Excess in:	Reallocated to:
1971	Residual Fuel Oil	294	Kansas	Oklahoma
1973	Residual Fuel Oil	45	Group 4: Kentucky, Tennessee	Illinois
1979	HGL (propane)	173	Montana	Wyoming
1985	Residual Fuel Oil	212	PAD District 4	PAD District 5
1986	Residual Fuel Oil	403	PAD District 4	PAD District 5
1987	Residual Fuel Oil	497	PAD District 4	PAD District 5
1988	Residual Fuel Oil	305	PAD District 4	PAD District 5
1989	Residual Fuel Oil	381	PAD District 4	PAD District 5
1990	Residual Fuel Oil	336	PAD District 4	PAD District 5
1991	Residual Fuel Oil	378	PAD District 4	PAD District 5
1992	Residual Fuel Oil	361	PAD District 4	PAD District 5
1996	Residual Fuel Oil	184	PAD District 4	PAD District 5
1997	Residual Fuel Oil	100	PAD District 4	PAD District 5
1998	Residual Fuel Oil	82	PAD District 4	PAD District 5
1999	Residual Fuel Oil	142	PAD District 4	PAD District 5
2000	Residual Fuel Oil	224	PAD District 4	PAD District 5
2001	Residual Fuel Oil	149	PAD District 4	PAD District 2
2001	Residual Fuel Oil	95	PAD District 5	PAD District 2
2001	Residual Fuel Oil	281	PAD District 5	PAD District 1
2002	Residual Fuel Oil	33	PAD District 5	PAD District 3
2002	Residual Fuel Oil	67	PAD District 5	PAD District 4
2003	Residual Fuel Oil	228	PAD District 5	PAD District 3
2004	Residual Fuel Oil	296	PAD District 5	PAD District 3
2005	HGL (propane)	198	PAD District 5	PAD District 4

Source: EIA calculations based on data from the State Energy Data System and the *Petroleum Supply Annual*.

this crude oil is removed from SEDS industrial sector consumption.

Natural gas lease and plant fuel. Natural gas consumed as lease and plant fuel is process fuel and is subtracted from SEDS industrial sector natural gas totals by state and year.

Natural gas for pipeline and distribution use. Most of the natural gas consumed in the transportation sector is used to power pipelines. As such, it is a process fuel and is subtracted from SEDS consumption in order to calculate expenditures.

Electricity exports. Electricity exported to Canada and Mexico are excluded

from the calculations of U.S. domestic energy expenditures and U.S. average energy prices.

Electrical system energy losses. The amount of energy lost during generation, transmission, and distribution of electricity (including plant use and unaccounted for electrical energy) is process fuel and is subtracted from sectoral energy consumption estimates used in the price and expenditure tables. The energy losses are “paid for” when residential, commercial, industrial, and transportation sector consumers buy the electricity produced by the electric power sector.

Energy losses and co-products from the production of fuel ethanol. Fuel ethanol is produced from corn and other biomass inputs that are not included elsewhere as energy sources. The difference in heat content of the feedstock and the fuel ethanol is considered process fuel and is subtracted from sector energy consumption estimates used in the price and expenditure tables.

Data sources

Capacity of petroleum refineries. 1982 forward: EIA, *Refinery Capacity Report*, <http://www.eia.gov/petroleum/refinerycapacity/> or *Petroleum Supply Annual, Volume 1*, <http://www.eia.gov/petroleum/supply/annual/volume1/> tables titled “Number and Capacity of Operable Petroleum Refineries,” columns titled, “Crude Capacity, Barrels per Calendar Day, Operating” (1982-1985), “Atmospheric Crude Oil Distillation Capacity, Barrels per Calendar Day, Operating” (1986-2012), and “Atmospheric Crude Oil Distillation Capacity, Barrels per Calendar Day, Total” (2013 forward), adjusted with information on “New, Shutdown and Activated Refineries” (2011 forward).

1979-1981: EIA, Energy Data Reports, *Petroleum Refineries in the United States and U.S. Territories*, table titled “Number and Capacity of Petroleum Refineries,” column heading, “Crude Capacity, Barrels per Calendar Day, Operating.”

1978: EIA, Energy Data Reports, *Petroleum Refineries in the United States and Puerto Rico*, table titled “Number and Capacity of Petroleum Refineries,” column heading, “Crude Capacity, Barrels per Calendar Day, Operating.”

1970-1977: Bureau of Mines, U.S. Department of the Interior, Mineral Industry Surveys, *Petroleum Refineries in the United States and Puerto Rico*, table titled “Number and Capacity of Petroleum Refineries,” column heading, “Crude Capacity, Barrels per Calendar Day, Operating.”

Fuel consumed at refineries. 2013 forward: EIA unpublished data on fuels consumed at refineries for selected states.

1981-1994, 1996, and 1998 forward: EIA, *Petroleum Supply Annual, Volume 1*, <http://www.eia.gov/petroleum/supply/annual/volume1/> table titled “Fuels

Consumed at Refineries by PAD District." Data for 1991 are from a separately published EIA *Errata* dated November 10, 1992, GPO Stock No. 061-003-00758-9.

1995, 1997: EIA, *Petroleum Supply Annual, Volume 1*, table titled "Fuels Consumed at Refineries by PAD District." Data for coal, electricity, and natural gas are not published, and values for the previous year are repeated.

1976-1980: EIA, Energy Data Reports, *Crude Petroleum, Petroleum Products, and Natural Gas Liquids*, table titled "Fuels Consumed for All Purposes at Refineries in the United States, by States."

1970-1975: Bureau of Mines, U.S. Department of the Interior, Mineral Industry Surveys, *Crude Petroleum, Petroleum Products, and Natural Gas Liquids*, table titled "Fuels Consumed for All Purposes at Refineries in the United States, by States."

Intermediate products. 1970 forward: EIA, State Energy Data System, industrial sector consumption estimates for aviation gasoline blending components, crude oil, motor gasoline blending components, natural gasoline (1970-1983), natural gasoline (formerly pentanes plus) (1984 through 2009), petroleum coke, plant condensate (1970-1983), still gas (excluding still gas consumed as petrochemical feedstocks, 1970-1985), unfinished oils, and unfractionated streams (1970-1983).

Natural gas lease, plant, and pipeline fuel use. 1997 forward: EIA, *Natural Gas Annual*, Tables 26 through 76. Also available at http://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm.

1993-1996: EIA *Historical Natural Gas Annual 1930 Through 2000*, http://www.eia.gov/oil_gas/natural_gas/data_publications/historical_natural_gas_annual/hnga.html Table 15.

1970-1992: EIA *Natural Gas Annual 1994, Volume II*, Table 14.

Residential wood. 1990 forward: EIA, unpublished data from the "1993 Residential Energy Consumption Survey," Form EIA-457 <http://www.eia.gov/consumption/residential/index.php>.

1970-1989: EIA, unpublished data from the "1980 Residential Energy Consumption Survey," Form EIA-457.

Commercial wood and waste. 1990 forward: EIA, unpublished data from the "1993 Residential Energy Consumption Survey," Form EIA-457 <http://www.eia.gov/consumption/residential/index.php>.

1989-2011: EIA, SEDS, U.S. annual average percentages of wood and percentages of waste acquired at no cost by the electric power sector. See

data sources for estimating wood and waste prices for the electric power sector in Section 5.

1970-1989: EIA, unpublished data from the "1980 Residential Energy Consumption Survey," Form EIA-457.

Industrial wood and waste. 1994 forward: EIA, unpublished data from the "1994 Manufacturing Energy Consumption Survey" (Form EIA-846) <http://www.eia.gov/consumption/manufacturing/>.

1989-2011: EIA, SEDS, U.S. annual average percentages of wood and percentages of waste acquired at no cost by the electric power sector. See data sources for estimating wood and waste prices for the electric power sector in Section 5.

1970-1993: EIA, unpublished data from the "1991 Manufacturing Energy Consumption Survey" (Form EIA-846).