Emissions and Storage Factors for Non-Energy Uses of Coal

Climate Mitigation Services
Rick Heede
Carbon Majors Project
19-Jul-12

EIA, AER, Table 1.15 Fossil Fuel Consumption for Nonfuel Use, 1980-2010

This table amends EIA data to show sequestration & emissions

Coal

Year	Total Non-energy Non-energy use (million tons)	Amnt Emitted 25% (million tons)	Total Coal Supplied (million tons)	Non-energy uses, Percent of total supplied (check)	Non-energy emissions, Percent of total supplied (check)	Non-energy storage Percent of total supplied (check)
	EIA done		EIA done			
1980	2.40	0.60	702.7	0.34%	0.09%	0.26%
1981	2.10	0.53	732.6	0.29%	0.07%	0.21%
1982	1.40	0.35	706.9	0.20%	0.05%	0.15%
1983	1.20	0.30	736.7	0.16%	0.04%	0.12%
1984	1.50	0.38	791.3	0.19%	0.05%	0.14%
1985	1.10	0.28	818.0	0.13%	0.03%	0.10%
1986	0.70	0.18	804.2	0.09%	0.02%	0.07%
1987	0.80	0.20	836.9	0.10%	0.02%	0.07%
1988	0.70	0.18	883.6	0.08%	0.02%	0.06%
1989	0.60	0.15	895.0	0.07%	0.02%	0.05%
1990	0.60	0.15	904.5	0.07%	0.02%	0.05%
1991	0.60	0.15	899.2	0.07%	0.02%	0.05%
1992	1.20	0.30	907.7	0.13%	0.03%	0.10%
1993	0.90	0.23	944.1	0.10%	0.02%	0.07%
1994	0.90	0.23	951.3	0.09%	0.02%	0.07%
1995	0.90	0.23	962.1	0.09%	0.02%	0.07%
1996	0.90	0.23	1,006.3	0.09%	0.02%	0.07%
1997	0.90	0.23	1,029.5	0.09%	0.02%	0.07%
1998	0.80	0.20	1,037.1	0.08%	0.02%	0.06%
1999	0.80	0.20	1,038.6	0.08%	0.02%	0.06%
2000	0.80	0.20	1,084.1	0.07%	0.02%	0.06%
2001	0.70	0.18	1,060.1	0.07%	0.02%	0.05%
2002	0.70	0.18	1,066.4	0.07%	0.02%	0.05%
2003	0.70	0.18	1,094.9	0.06%	0.02%	0.05%
2004	0.70	0.18	1,107.3	0.06%	0.02%	0.05%
2005	0.70	0.18	1,126.0	0.06%	0.02%	0.05%
2006	0.60	0.15	1,112.3	0.05%	0.01%	0.04%
2007	0.60	0.15	1,128.0	0.05%	0.01%	0.04%
2008	0.60	0.15	1,120.5	0.05%	0.01%	0.04%
2009	0.40	0.10	997.5	0.04%	0.01%	0.03%
2010	0.60	0.15	1,048.3	0.06%	0.01%	0.04%

31-yr average sequestration factor for coal 0.077%

Coal

	Alternative Non-energy use (QBtu)	Non-energy use (QBtu)	Carbon Coefficent (MtC/QBtu)	Carbon Content (MtC)	Quant emitted 90.00% (MtCO2)	Quantity stored 10.00% (MtCO2)	coal emissions (MtCO2)	Non-energy emission rate Percent of total emissions (Percent)	Non-energy storage rate Percent of total emissions (Percent)
	EPA	EIA done	EPA done	calculated done	calculated done	calculated done	EIA done	calculated done	calculated done
1980		0.08	25.96	2.08	6.85	0.76	1,436	0.48%	0.053%
1981		0.07	25.96	1.82	6.00	0.67	1,485	0.40%	0.045%
1982		0.04	25.96	1.04	3.43	0.38	1,433	0.24%	0.027%
1983		0.04	25.96	1.04	3.43	0.38	1,488	0.23%	0.026%
1984		0.05	25.96	1.30	4.28	0.48	1,598	0.27%	0.030%
1985		0.03	25.96	0.78	2.57	0.29	1,638	0.16%	0.017%
1986		0.02	25.96	0.52	1.71	0.19	1,617	0.11%	0.012%
1987		0.03	25.96	0.78	2.57	0.29	1,691	0.15%	0.017%
1988		0.02	25.96	0.52	1.71	0.19	1,775	0.10%	0.011%
1989		0.02	25.96	0.52	1.71	0.19	1,795	0.10%	0.011%
1990	0.0082	0.02	25.96	0.52	1.71	0.19	1,821	0.09%	0.010%
1991		0.02	25.96	0.52	1.71	0.19	1,807	0.09%	0.011%
1992		0.04	25.95	1.04	3.43	0.38	1,822	0.19%	0.021%
1993		0.03	25.95	0.78	2.57	0.29	1,882	0.14%	0.015%
1994		0.03	25.94	0.78	2.57	0.29	1,893	0.14%	0.015%
1995	0.0491	0.03	25.93	0.78	2.57	0.29	1,913	0.13%	0.015%
1996	0.0355	0.03	25.93	0.78	2.57	0.29	1,995	0.13%	0.014%
1997	0.0112	0.03	25.93	0.78	2.57	0.29	2,040	0.13%	0.014%
1998	0.0213	0.03	25.95	0.78	2.57	0.29	2,064	0.12%	0.014%
1999	0.0512	0.03	25.98	0.78	2.57	0.29	2,062	0.12%	0.014%
2000	0.0660	0.03	26.00	0.78	2.57	0.29	2,155	0.12%	0.013%
2001	0.0361	0.02	26.00	0.52	1.72	0.19	2,088	0.08%	0.009%
2002	0.0523	0.02	26.05	0.52	1.72	0.19	2,095	0.08%	0.009%
2003	0.0638	0.02	26.09	0.52	1.72	0.19	2,136	0.08%	0.009%
2004	0.1797	0.02	26.10	0.52	1.72	0.19	2,160	0.08%	0.009%
2005	0.0924	0.02	26.09	0.52	1.72	0.19	2,182	0.08%	0.009%
2006	0.0748	0.02	26.04	0.52	1.72	0.19	2,147	0.08%	0.009%
2007	0.0142	0.02	26.05	0.52	1.72	0.19	2,172	0.08%	0.009%
2008	0.0410	0.02	26.05	0.52	1.72	0.19	2,139	0.08%	0.009%
2009	0.0183	0.01	26.05	0.26	0.86	0.10	1,876	0.05%	0.005%
2010	0.0768	0.02	26.05	0.52	1.72	0.19	1,985	0.09%	0.010%
		0.0294	25.9885	0.7626	2.5167	0.2796	1,884	0.14%	

Average storage rate 1980-2010 for non-energy uses of coal (USA) 0.016%

linked to EF worksheet

Table A-252: 2009 Non-Energy Carbon Stored in Products

Fuel Type	Consumption for Non-Energy Use (TBtu)	Carbon Coefficients (Tg Carbon/QBtu)	Carbon Content (Tg Carbon)	Fraction Sequestered	Carbon Stored (Tg CO_2 Eq.)
Coal	6.1	31.00	0.2	0.10	**0.07**
Natural Gas	366.0	14.46	5.3	0.58	**11.26**
Asphalt & Road Oil	873.1	20.55	17.9	1.00	**65.51**
LPG	1,446.2	17.06	24.7	0.58	**52.53**
Lubricants	262.6	20.20	5.3	0.09	**1.79**
Pentanes Plus	93.4	19.10	1.8	0.58	**3.80**
Petrochemical Feedstocks	[a]	[a]	[a]	[a]	**40.33**
Petroleum Coke	133.0	27.85	3.7	0.30	**4.08**
Special Naphtha	44.2	19.74	0.9	0.58	**1.86**
Waxes/Misc.	[a]	[a]	[a]	[a]	**1.16**
Misc. U.S. Territories Petroleum	[a]	[a]	[a]	[a]	**0.41**
Total					**182.8**

[a] Values for Misc. U.S. Territories Petroleum, Petrochemical Feedstocks and Waxes/Misc. are not shown because these categories are aggregates of numerous smaller components.
Note: Totals may not sum due to independent rounding.

Table A-253: 2009 Reference Approach CO_2 Emissions from Fossil Fuel Consumption (Tg CO_2 Eq. unless otherwise noted)

Fuel Category	Potential Emissions	Carbon Sequestered	Net Emissions	Fraction Oxidized	Total Emissions
Coal	1,834.9	0.1	1,834.8	100.0%	1,834.8
Petroleum	2,383.7	171.4	2,212.2	100.0%	2,212.2
Natural Gas	1,251.6	11.3	1,240.4	100.0%	1,240.4
Total	**5,470.2**	**182.8**	**5,287.4**	-	**5,287.4**

Note: Totals may not sum due to independent rounding.

U.S. EPA (2011) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2009,

Table A-256: 2010 Non-Energy Carbon Stored in Products

Fuel Type	Consumption for Non-Energy Use (TBtu)	Carbon Coefficients (Tg Carbon/QBtu)	Carbon Content (Tg Carbon)	Fraction Sequestered	Carbon Stored (Tg CO_2 Eq.)
Coal	64.9	25.61	1.66	0.10	**0.6**
Natural Gas	221.9	14.46	3.21	0.59	**7.0**
Asphalt & Road Oil	877.8	20.55	18.04	1.00	**65.9**
LPG	1,545.8	17.06	26.37	0.59	**57.4**
Lubricants	291.7	20.20	5.89	0.09	**2.0**
Pentanes Plus	103.6	19.10	1.98	0.59	**4.3**
Petrochemical Feedstocks	[a]	[a]	[a]	[a]	**43.1**
Petroleum Coke	3.0	27.85	0.08	0.30	**0.1**
Special Naphtha	25.5	19.74	0.50	0.59	**1.1**
Waxes/Misc.	[a]	[a]	[a]	[a]	**1.3**
Misc. U.S. Territories Petroleum	[a]	[a]	[a]	[a]	**0.4**
Total					**183.1**

[a] Values for Misc. U.S. Territories Petroleum, Petrochemical Feedstocks and Waxes/Misc. are not shown because these categories are aggregates of numerous smaller components.
Note: Totals may not sum due to independent rounding.

Table A-257: 2010 Reference Approach CO_2 Emissions from Fossil Fuel Consumption (Tg CO_2 Eq. unless otherwise noted)

Fuel Category	Potential Emissions	Carbon Sequestered	Net Emissions	Fraction Oxidized	Total Emissions
Coal	1,898.9	0.6	1,898.3	100.0%	1,898.3
Petroleum	2,367.2	175.5	2,191.7	100.0%	2,191.7
Natural Gas	1,297.1	7.0	1,290.1	100.0%	1,290.1
Total	**5,563.2**	**183.1**	**5,380.1**	-	**5,380.1**

Note: Totals may not sum due to independent rounding.

U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, (Draft),
Annex 4 IPCC Reference Approach for Estimating CO2 Emissions from Fossil Fuel Combustion,
Table A-256: 2010 Non-Energy Carbon Stored in Products.

Table A-32: Unadjusted Non-Energy Fuel Consumption (TBtu)

Sector/Fuel Type	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Industry	**4,466.6**	**5,157.0**	**5,230.2**	**5,429.2**	**5,683.8**	**5,938.6**	**5,578.6**	**5,246.1**	**5,335.4**	**5,283.9**	**5,807.9**	**5,497.3**	**5,292.2**	**5,088.3**	**4,665.7**	**4,337.0**	**4,436.6**
Industrial Coking Coal	0.0	37.8	24.1	0.0	10.9	40.1	53.6	24.8	40.3	51.9	167.8	80.5	62.9	2.3	29.1	6.4	64.9
Industrial Other Coal	8.2	11.3	11.4	11.2	10.4	11.1	12.4	11.3	12.0	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
Natural Gas to Chemical Plants, Other Uses	286.5	357.2	360.3	386.7	426.6	436.4	436.7	406.6	380.7	384.1	399.5	403.5	233.4	233.6	233.6	233.6	233.6
Asphalt & Road Oil	1,170.2	1,178.2	1,175.9	1,223.6	1,262.6	1,324.4	1,275.7	1,256.9	1,240.0	1,219.5	1,303.8	1,323.2	1,261.2	1,197.0	1,012.0	873.1	877.8
LPG	1,201.4	1,586.9	1,652.0	1,670.4	1,744.4	1,820.7	1,665.4	1,553.4	1,620.3	1,545.1	1,576.4	1,488.1	1,519.5	1,542.2	1,451.4	1,546.1	1,614.2
Lubricants	186.3	177.8	172.5	182.3	190.8	192.8	189.9	174.0	171.9	159.0	161.0	160.2	156.1	161.2	149.6	134.5	149.5
Pentanes Plus	82.6	303.4	316.5	298.9	204.3	261.4	236.7	201.6	171.4	169.1	170.4	150.3	107.3	137.4	117.2	97.7	107.6
Naphtha (<401 deg. F)	347.8	373.0	479.3	536.4	584.0	502.1	613.5	493.7	582.6	613.0	749.4	698.7	628.9	562.5	477.2	471.9	490.4
Other Oil (>401 deg. F)	753.9	801.0	729.6	861.3	818.7	811.1	722.2	662.4	632.1	699.4	779.5	708.0	790.6	744.1	647.8	424.8	452.7
Still Gas	21.3	40.1	0.0	2.1	0.0	16.1	12.6	35.8	57.8	59.0	62.9	67.7	57.2	44.2	47.3	133.9	147.2
Petroleum Coke	123.1	75.0	89.4	35.8	150.8	216.0	98.7	174.3	145.8	122.8	218.3	186.9	213.6	201.2	225.1	175.5	68.8
Special Naphtha	107.1	70.8	74.5	72.3	107.3	145.4	97.4	78.5	102.4	80.5	51.0	62.5	70.1	78.0	84.9	46.2	26.5
Other (Wax/Misc.)																	
Distillate Fuel Oil	7.0	6.8	6.8	6.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	17.5	17.5	17.5	17.5	17.5
Waxes	33.3	40.6	48.7	43.7	42.4	37.4	33.1	36.3	32.2	31.0	30.8	31.4	26.1	21.9	19.1	12.2	15.4
Miscellaneous Products	137.8	97.1	89.0	97.8	119.0	111.9	119.2	124.9	134.2	126.0	113.4	112.8	136.0	133.5	142.0	151.8	158.8
Transportation	**176.0**	**167.9**	**163.0**	**172.1**	**180.2**	**182.1**	**179.4**	**164.3**	**162.4**	**150.1**	**152.1**	**151.3**	**147.4**	**152.2**	**141.3**	**127.1**	**141.2**
Lubricants	176.0	167.9	163.0	172.1	180.2	182.1	179.4	164.3	162.4	150.1	152.1	151.3	147.4	152.2	141.3	127.1	141.2
U.S. Territories	**86.7**	**90.8**	**121.7**	**131.6**	**135.0**	**139.3**	**152.2**	**80.3**	**140.2**	**123.5**	**110.8**	**121.9**	**133.4**	**108.4**	**126.7**	**56.3**	**56.3**
Lubricants	0.7	2.0	1.5	2.5	1.3	1.4	3.1	0.0	3.0	4.9	5.1	4.6	6.2	5.9	2.7	1.0	1.0
Other Petroleum (Misc. Prod.)	86.0	88.8	120.2	129.1	133.8	138.0	149.1	80.3	137.2	118.6	105.7	117.3	127.2	102.5	124.1	55.2	55.2
Total	**4,729.3**	**5,415.8**	**5,514.9**	**5,732.9**	**5,999.0**	**6,260.0**	**5,910.1**	**5,490.8**	**5,637.9**	**5,557.5**	**6,070.8**	**5,770.5**	**5,573.0**	**5,349.0**	**4,933.8**	**4,520.3**	**4,634.1**

Note: These values are unadjusted non-energy fuel use provided by EIA. They have not yet been adjusted to remove petroleum feedstock exports and processes accounted for in the Industrial Processes Chapter.
+ Does not exceed 0.05 TBtu.

U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, (Draft),

Table A-32: Unadjusted Non-Energy Fuel Consumption (TBtu), Table A-32: Unadjusted Non-Energy Fuel Consumption (TBtu).

	million tons	Qbtu
Coke	32.37	0.73
Other ind'l	1.80	0.05

Table 2, page 258, Non-fuel use of fossil fuels in the U.S. in 1992

Table 2. Non-fuel Use of Fossil Fuels in the U.S. in 1992

Coal		Petroleum							N. Gas
Coke	Other	Petro-chemical feedstocks	Asphalt and Road Oil	Liquefied Petroleum Gases	Lubricant	Petroleum Coke	Special naphtha	Wax, etc.	Chemical feedstocks
Physical Unit / million short tons for coal; million barrels for oil; billion cubic feet for natural gas									
32.37	1.8	202	166	386	54	42	19	27	611
Energy Unit / Quadrillion Btu (10^{15} Btu)									
0.73	0.05	1.14	1.10	1.35	0.33	0.25	0.10	0.16	0.63

Song, Chunsan, & Harold H. Schobert (1996) Non-Fuel Uses of Coals and Synthesis of Chemicals and Materials,
Fuel Science Program, Pennsylvania State Univeristy, University Park
pages 249-258 of unknown publication;
web.anl.gov/PCS/acsfuelpreprint%20archive/Files/Merge/Vol-40_2-0004.pdf

Table 3-21: 2010 Adjusted Non-Energy Use Fossil Fuel Consumption, Storage, and Emissions

Sector/Fuel Type	Adjusted Non-Energy Use[a] (TBtu)	Carbon Content Coefficient (Tg C/QBtu)	Potential Carbon (Tg C)	Storage Factor	Carbon Stored (Tg C)	Carbon Emissions (Tg C)	Carbon Emissions (Tg CO_2 Eq.)
Industry	**4,217.7**	-	**78.5**	-	**49.6**	**28.9**	**106.1**
Industrial Coking Coal	64.9	25.61	1.7	0.10	0.2	1.5	5.5
Industrial Other Coal	11.9	25.82	0.3	0.59	0.2	0.1	0.5

U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, (Draft),
Table 3-21: 2010 Adjusted Non-Energy Use Fossil Fuel Consumption, Storage, and Emissions; pdf page 124.

Coal byproducts in tree form showing basic chemicals as branches and derivative substances as twigs and leaves.
Source: Virginia Surface Mining and Reclamation Association, Inc., Norton, Va.

Table A- 35: Annually Variable C Content Coefficients by Year (Tg C/QBtu)

Fuel Type	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Residential Coal	26.20	26.13	26.04	25.90	26.07	25.98	26.01	26.00	25.98	26.04	25.91	26.09	26.29	25.94	25.71	25.71*	25.71*
Commercial Coal	26.20	26.13	26.04	25.90	26.07	25.98	26.01	26.00	25.98	26.04	25.91	26.09	26.29	25.94	25.71	25.71*	25.71*
Industrial Coking Coal	25.53	25.57	25.56	25.59	25.62	25.59	25.63	25.63	25.65	25.63	25.63	25.60	25.60	25.61	25.61	25.61	25.61
Industrial Other Coal	25.82	25.93	25.93	25.93	25.95	25.98	26.00	26.00	26.05	26.09	26.10	26.09	26.04	26.05	26.05	26.05	26.05
Electric Power Coal	25.96	16.99	16.99	16.99	16.99	16.99	16.98	16.99	16.98	17.00	16.98	16.98	16.96	16.94	16.95	16.90	16.91
Pipeline Natural Gas	14.45	14.46	14.46	14.46	14.44	14.46	14.47	14.46	14.46	14.44	14.46	14.46	14.46	14.46	14.46	14.46	14.46
LPG (energy use)	16.86	16.82	16.82	16.84	16.81	16.86	16.89	16.87	16.85	16.86	16.84	16.84	16.83	16.82	16.83	16.83	16.83
LPG (non-energy use)	17.06	17.09	17.10	17.08	17.08	17.07	17.09	17.10	17.09	17.09	17.07	17.06	17.06	17.05	17.06	17.06	17.06
Motor Gasoline	19.42	19.36	19.35	19.36	19.37	19.32	19.33	19.34	19.38	19.36	19.38	19.36	19.45	19.56	19.46	19.46	19.46
Jet Fuel	19.40	19.34	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70
MoGas Blend Components	19.42	19.36	19.35	19.36	19.37	19.32	19.33	19.34	19.38	19.36	19.38	19.36	19.45	19.56	19.46	19.46	19.46
Misc. Products	20.15	20.21	20.23	20.22	20.22	20.17	20.22	20.27	20.28	20.25	20.31	20.31	20.28	20.28	20.31	20.31	20.31
Unfinished Oils	20.15	20.21	20.23	20.22	20.22	20.17	20.22	20.27	20.28	20.25	20.31	20.31	20.28	20.28	20.31	20.31	20.31
Crude Oil	20.15	20.21	20.23	20.22	20.22	20.17	20.22	20.27	20.28	20.25	20.31	20.31	20.28	20.28	20.31	20.31	20.31

*U.S. EIA discontinued collection of residential sector coal consumption data in 2008, because consumption of coal in the residential sector is extremely limited. Therefore, the number cited here is developed from commercial/institutional consumption.
Source: EPA (2010a)

U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, (Draft),
Annex 2: Methodology and Data for Estimating CO2 Emissions from Fossil Fuel Combustion,
Table A-35: Annually Variable C Content Coefficients by Year (Tg C/ QBtu)

Schweinfurth, S.P., 2009, An introduction to coal quality, in Pierce, B.S., and Dennen, K.O., eds., The National Coal Resource Assessment Overview: U.S. Geological Survey Professional Paper 1625–F, Chapter C, 16 p.

Cell: D11
Comment: Rick Heede:
EIA(2004) Documentation for Emissions of Greenhouse Gases in the United States 2002, p. 31-32. While coke for steel production is typically considered the main non-fuel use of coal, EIA correctly points out that coke is nearly always fully combusted in metallurgical processes. Coke is manufactured by "coking" high-grade (typically anthracite) coals in the absence of oxygen in which volatiles, moisture, and other impurities are driven off, leaving a high-carbon material suitable for metallurgical uses. EIA thus focuses on the production of "coal tars" as a nonfuel use and represents the amounts reported under "nonfuel use of coal" in EIA's table 1.15." EIA uses a carbon coefficient of 25.376 kgC/million Btu.
EIA adopts the IPPC guideline of 75 percent sequestration of coal tars.

Cell: E11
Comment: Rick Heede:
EIA (2005) Annual Energy review 2004, Table 7.1 Coal Overview, 1949-2004

Cell: P12
Comment: Rick Heede:
EPA uses a 10 percent storage factor for coal used for non-energy purposes (64.9 T Btu in 2010). Source: U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, (Draft),Annex 4 IPCC Reference Approach for Estimating CO2 Emissions from Fossil Fuel Combustion,Table A-256: 2010 Non-Energy Carbon Stored in Products.

Cell: D13
Comment: Rick Heede:
EIA adopts the IPPC guideline of 75 percent sequestration of coal tars, I.e., 25 percent is emitted through subsequent oxidation or combustion. See cell note above.

Cell: C17
Comment: Rick Heede:
U. S. Energy Information Administration (2011) Annual Energy Review 2010 Table 1.15 Fossil Fuel Consumption for Nonfuel Use Estimates, 1980-2010, www.eia.gov/totalenergy/data/annuał

Cell: K17
Comment: Rick Heede:
U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2010, Table A-32: Unadjusted Non-Energy Fuel Consumption, and Table 3-21: 2010 Adjusted Non-Energy Use Fossil Fuel Consumption, Storage, and Emissions. These tables are reproduced at right.

Cell: L17
Comment: Rick Heede:
U. S. Energy Information Administration (2011) Annual Energy Review 2010 Table 1.15 Fossil Fuel Consumption for Nonfuel Use Estimates, 1980-2010, www.eia.gov/totalenergy/data/annuał

Cell: M17
Comment: Rick Heede:
EPA (2011) Inventory of U.S.: 1990 – 2009, Annex 2: Methodology and Data for Estimating CO2 Emissions from Fossil Fuel Combustion, Table A-34: Annually Variable Carbon Content Coefficients by Year (Tg Carbon/QBtu); see table at right.

Cell: Q17
Comment: Rick Heede:
U. S. Energy Information Administration (2011) Annual Energy Review 2010, page 317: Table 11.2 Carbon Dioxide Emissions From Energy Consumption by Source, Selected Years, 1949-2010 (Million Metric Tons of Carbon Dioxide). Note: "Data are estimates for carbon dioxide emissions from energy consumption, including the nonfuel use of fossil fuels."

Cell: BC28
Comment: Rick Heede:
Coal byproducts in tree form showing basic chemicals as branches and derivative substances as twigs and leaves. The basic chemicals may be obtained from coal through heating in a closed container (destructive distillation); the derivatives require additional processing of those basic materials. One ton of bituminous coal roasted in an airtight oven (destructive distillation) produces approximately 1,300 to 1,500 pounds of coke, 8 to 10 gallons of coal tar, 3 gallons of light oil, 5 to 6 pounds of ammonia, and 9,500 to 11,000 cubic feet of gas. Modified from Virginia Surface Mining and Reclamation Association, Inc., Norton, Va. (public domain illustration).

Cell: K34
Comment: Rick Heede:
EIA data cited in EPA (2012) Table A-32 differs from EIA's final non-energy uses of coal reproduced in column L. U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, (Draft), Annex 2: Methodology and Data for Estimating CO2 Emissions from Fossil Fuel Combustion, Table A-32: Unadjusted Non-Energy Fuel Consumption (TBtu).

Cell: K48
Comment: Rick Heede:

EPA cites EIA data on non-energy uses of coking coal as 6.1 TBtu (0.0061 QBtu), not including 11.9 TBtu for “industrial other coal” shown in EPA’s Table A-32 at right. The EIA estimate for 2009 is 0.01 QBtu, which is shown in the table at right.
The EPA (2012) data for 2010 (also shown at right in Table A-256) increased to 64.9 TBtu, not including EIA’s “industrial other coal” of 11.9 TBtu). Source: U.S. Environmental Protection Agency (2011 and 2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2009, Annex 4: IPCC Reference Approach for Estimating CO2 Emissions from Fossil Fuel Combustion, Table A-252: 2009 Non-Energy Carbon Stored in Products, and Table A-256 for 2010 data. (Note: both tables are reproduced at right.)

Cell: P48
Comment: Rick Heede:
The result, using EIA non-energy data for 2009, is 0.996 MtCO2 sequestered, or 0.005 percent of total coal emissions of 1,876 MtCO2. The EPA estimate for 2009 (using Table A-252 at right) is 0.7 MtCO2 of total coal emissions of 1,841 MtCO2 (EPA 2011 Inventory, Table A-11),or 0.0038 percent of total.

Cell: BG53
Comment: Rick Heede:

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