

## Emission Factors for Greenhouse Gas Inventories

Last Modified: 7 November 2011

Typically, greenhouse gas emissions are reported in units of carbon dioxide equivalent (CO<sub>2</sub>e). Gases are converted to CO<sub>2</sub>e by multiplying by the gas' global warming potential (GWP). The emission factors listed in this sheet have not been converted to CO<sub>2</sub>e. In order to do so, multiply the emissions by the corresponding GWP listed in the table below.

Gas	GWP
CH <sub>4</sub>	21
N <sub>2</sub> O	310

**Source:**  
Intergovernmental Panel on Climate Change (IPCC) (1995);  
Second Assessment Report.

**Table 1 Stationary Combustion Emission Factors**

Fuel Type	Heating Value	CO <sub>2</sub> Factor	CH <sub>4</sub> Factor	N <sub>2</sub> O Factor	CO <sub>2</sub> Factor	CH <sub>4</sub> Factor	N <sub>2</sub> O Factor	Unit
	mmBtu per short ton	kg CO <sub>2</sub> per mmBtu	g CH <sub>4</sub> per mmBtu	g N <sub>2</sub> O per mmBtu	kg CO <sub>2</sub> per short ton	g CH <sub>4</sub> per short ton	g N <sub>2</sub> O per short ton	
<b>Coal and Coke</b>								
Anthracite Coal	25.09	103.54	11	1.6	2,598	276	40	short tons
Bituminous Coal	24.93	93.40	11	1.6	2,328	274	40	short tons
Sub-bituminous Coal	17.25	97.02	11	1.6	1,674	190	28	short tons
Lignite Coal	14.21	96.36	11	1.6	1,369	156	23	short tons
Mixed (Commercial Sector)	21.39	95.26	11	1.6	2,038	235	34	short tons
Mixed (Electric Power Sector)	19.73	94.38	11	1.6	1,862	217	32	short tons
Mixed (Industrial Coking)	26.28	93.65	11	1.6	2,461	289	42	short tons
Mixed (Industrial Sector)	22.35	93.91	11	1.6	2,099	246	36	short tons
Coke	24.80	102.04	11	1.6	2,531	273	40	short tons
<b>Fossil Fuel-derived Fuels (Solid)</b>								
Municipal Solid Waste	9.95	90.70	32	4.2	902	318	42	short tons
Petroleum Coke (Solid)	30.00	102.41	32	4.2	3,072	960	126	short tons
Plastics	38.00	75.00	32	4.2	2,850	1,216	160	short tons
Tires	26.87	85.97	32	4.2	2,310	860	113	short tons
<b>Biomass Fuels (Solid)</b>								
Agricultural Byproducts	8.25	118.17	32	4.2	975	264	35	short tons
Peat	8.00	111.84	32	4.2	895	256	34	short tons
Solid Byproducts	25.83	105.51	32	4.2	2,725	827	108	short tons
Wood and Wood Residuals	15.38	93.80	32	4.2	1,443	492	65	short tons
<b>Natural Gas</b>								
Natural Gas (per scf)	0.001028	53.02	1.0	0.10	0.05450	0.001028	0.000103	scf
<b>Fossil-derived Fuels (Gaseous)</b>								
Blast Furnace Gas	0.000092	274.32	0.022	0.10	0.02524	0.000002	0.000009	scf
Coke Oven Gas	0.000599	46.85	0.480	0.10	0.02806	0.000288	0.000060	scf
Fuel Gas	0.001388	59.00	0.022	0.10	0.08189	0.000031	0.000139	scf
Propane Gas	0.002516	61.46	0.022	0.10	0.15463	0.000055	0.000252	scf
<b>Biomass Fuels (Gaseous)</b>								
Biogas (Captured Methane)	0.000841	52.07	3.200	0.630	0.04379	0.002691	0.000530	scf
<b>Petroleum Products</b>								
Asphalt and Road Oil	0.158	75.36	3.0	0.60	11.91	0.47	0.09	gallon
Aviation Gasoline	0.120	69.25	3.0	0.60	8.31	0.36	0.07	gallon
Butane	0.101	65.15	3.0	0.60	6.58	0.30	0.06	gallon
Butylene	0.103	67.73	3.0	0.60	6.98	0.31	0.06	gallon
Crude Oil	0.138	74.49	3.0	0.60	10.28	0.41	0.08	gallon
Distillate Fuel Oil No. 1	0.139	73.25	3.0	0.60	10.18	0.42	0.08	gallon
Distillate Fuel Oil No. 2	0.138	73.96	3.0	0.60	10.21	0.41	0.08	gallon
Distillate Fuel Oil No. 4	0.146	75.04	3.0	0.60	10.96	0.44	0.09	gallon
Ethane	0.069	62.64	3.0	0.60	4.32	0.21	0.04	gallon
Ethylene	0.100	67.43	3.0	0.60	6.74	0.30	0.06	gallon
Heavy Gas Oils	0.148	74.92	3.0	0.60	11.09	0.44	0.09	gallon
Isobutane	0.097	64.91	3.0	0.60	6.30	0.29	0.06	gallon
Isobutylene	0.103	67.74	3.0	0.60	6.98	0.31	0.06	gallon
Kerosene	0.135	75.20	3.0	0.60	10.15	0.41	0.08	gallon
Kerosene-type Jet Fuel	0.135	72.22	3.0	0.60	9.75	0.41	0.08	gallon
Liquefied Petroleum Gases (LPG)	0.092	62.98	3.0	0.60	5.79	0.28	0.06	gallon
Lubricants	0.144	74.27	3.0	0.60	10.69	0.43	0.09	gallon
Motor Gasoline	0.125	70.22	3.0	0.60	8.78	0.38	0.08	gallon
Naphtha (<401 deg F)	0.125	68.02	3.0	0.60	8.50	0.38	0.08	gallon
Natural Gasoline	0.110	66.83	3.0	0.60	7.35	0.33	0.07	gallon
Other Oil (>401 deg F)	0.139	76.22	3.0	0.60	10.59	0.42	0.08	gallon
Pentanes Plus	0.110	70.02	3.0	0.60	7.70	0.33	0.07	gallon
Petrochemical Feedstocks	0.129	70.97	3.0	0.60	9.16	0.39	0.08	gallon
Petroleum Coke	0.143	102.41	3.0	0.60	14.64	0.43	0.09	gallon
Propane	0.091	61.46	3.0	0.60	5.59	0.27	0.05	gallon
Propylene	0.091	65.95	3.0	0.60	6.00	0.27	0.05	gallon
Residual Fuel Oil No. 5	0.140	72.93	3.0	0.60	10.21	0.42	0.08	gallon
Residual Fuel Oil No. 6	0.150	75.10	3.0	0.60	11.27	0.45	0.09	gallon
Special Naphtha	0.125	72.34	3.0	0.60	9.04	0.38	0.08	gallon
Still Gas	0.143	66.72	3.0	0.60	9.54	0.43	0.09	gallon
Unfinished Oils	0.139	74.49	3.0	0.60	10.35	0.42	0.08	gallon
Used Oil	0.135	74.00	3.0	0.60	9.99	0.41	0.08	gallon
<b>Biomass Fuels</b>								
Biodiesel (100%)	0.128	73.84	1.1	0.11	9.45	0.14	0.01	gallon
Ethanol (100%)	0.084	68.44	1.1	0.11	5.75	0.09	0.01	gallon
Rendered Animal Fat	0.125	71.06	1.1	0.11	8.88	0.14	0.01	gallon
Vegetable Oil	0.120	81.55	1.1	0.11	9.79	0.13	0.01	gallon
<b>Steam and Hot Water</b>								
Steam and Hot Water		88.18	8.169	0.603				mmBtu

**Sources:**

Solid, gaseous, liquid and biomass fuels: Federal Register (2009) EPA: 40 CFR Parts 86, 87, 89 et al; *Mandatory Reporting of Greenhouse Gases: Final Rule*, 30Oct09, 261 pp. Tables C-1 and C-2 at FR pp. 56400-56410. Revised emission factors for selected fuels: Federal Register (2010) EPA: 40 CFR Part 98; *Mandatory Reporting of Greenhouse Gases: Final Rule*, 17Dec10, 81 pp.  
Steam and Hot Water: United States, Energy Information Administration (2010); *Voluntary Reporting of Greenhouse Gases, 1605(b) Program*, Appendix N: Emissions Factors for Steam and Chilled Water.

**Table 2 CO<sub>2</sub> Emissions for Transportation Fuels for Road Vehicles, Locomotives, and Aircraft**

Fuel Type	kg CO <sub>2</sub> per unit	Unit
Aviation Gasoline	8.31	gallon
Biodiesel	9.45	gallon
Compressed Natural Gas (CNG)	0.0545	scf
Diesel Fuel	10.21	gallon
Ethane	4.32	gallon
Ethanol	5.75	gallon
Jet Fuel (kerosene type)	9.75	gallon
Liquefied Natural Gas (LNG)	4.46	gallon
LPG	5.79	gallon
Methanol	4.10	gallon
Motor Gasoline	8.78	gallon
Propane	5.59	gallon
Residual Fuel Oil (Resid #5; Bunker C)	11.27	gallon

**Sources:**

Federal Register (2009). *EPA: 40 CFR Parts 86, 87, 89 et al. Mandatory Reporting of Greenhouse Gases; Final Rule*, 30Oct09, 261 pp. Tables C-1 and C-2 at FR pp. 56409-56410.  
LNG sourced from: US EPA (2008). *Greenhouse Gas Inventory Protocol Core Module Guidance - Direct Emissions from Mobile Combustion Sources*, EPA Climate Leaders, Table B-5, p. 33.  
Methanol sourced from: The Climate Registry (2011). *General Reporting Protocol for the Voluntary Reporting Program*, Default Emission Factors, Table 13.1 US Default CO<sub>2</sub> Emission Factors for Transport Fuels.

**Table 3 CH<sub>4</sub> and N<sub>2</sub>O Emissions for Highway Vehicles**

Vehicle Type	Year	CH <sub>4</sub> Factor (g / mile)	N <sub>2</sub> O Factor (g / mile)
Gasoline Passenger Cars	1984-1993	0.0704	0.0647
	1994	0.0531	0.0560
	1995	0.0358	0.0473
	1996	0.0272	0.0426
	1997	0.0268	0.0422
	1998	0.0249	0.0393
	1999	0.0216	0.0337
	2000	0.0178	0.0273
	2001	0.0110	0.0158
	2002	0.0107	0.0153
	2003	0.0114	0.0135
	2004	0.0145	0.0083
	2005	0.0147	0.0079
	2006	0.0161	0.0057
	2007	0.0170	0.0041
	2008	0.0172	0.0038
2009-present	0.0173	0.0036	
Gasoline Light-duty Trucks (Vans, Pickup Trucks, SUVs)	1987-1993	0.0813	0.1035
	1994	0.0646	0.0982
	1995	0.0517	0.0908
	1996	0.0452	0.0871
	1997	0.0452	0.0871
	1998	0.0391	0.0728
	1999	0.0321	0.0564
	2000	0.0346	0.0621
	2001	0.0151	0.0164
	2002	0.0178	0.0228
	2003	0.0155	0.0114
	2004	0.0152	0.0132
	2005	0.0157	0.0101
	2006	0.0159	0.0089
	2007	0.0161	0.0079
	2008	0.0163	0.0066
2009-present	0.0163	0.0066	
Gasoline Heavy-duty Vehicles	1985-1986	0.4090	0.0515
	1987	0.3675	0.0849
	1988-1989	0.3492	0.0933
	1990-1995	0.3246	0.1142
	1996	0.1278	0.1680
	1997	0.0924	0.1726
	1998	0.0641	0.1693
	1999	0.0578	0.1435
	2000	0.0493	0.1092
	2001	0.0528	0.1235
	2002	0.0546	0.1307
	2003	0.0533	0.1240
	2004	0.0341	0.0285
	2005	0.0326	0.0177
	2006	0.0326	0.0175
	2007	0.0327	0.0173
	2008	0.0327	0.0171
	2009-present	0.0327	0.0169

**Sources:**

1984-2005 factors from: US EPA (2008). *Greenhouse Gas Inventory Protocol Core Module Guidance - Direct Emissions from Mobile Combustion Sources*, EPA Climate Leaders, Table 3.  
2006-2009 factors from: US EPA (2011). *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009*, EPA 430-R-11-005. All Values are calculated from Tables A-97 through A-100.

**Table 4 CH<sub>4</sub> and N<sub>2</sub>O Emissions for Highway Vehicles: Diesel and Alternative Fuels**

Vehicle Type	Vehicle Year	CH <sub>4</sub> Factor (g / mile)	N <sub>2</sub> O Factor (g / mile)
Diesel Passenger Cars	1960-1982	0.0006	0.0012
	1983-present	0.0005	0.0010
Diesel Light-duty Trucks	1960-1982	0.0011	0.0017
	1983-1995	0.0009	0.0014
	1996-present	0.0010	0.0015
Diesel Heavy-duty Vehicles	1960-present	0.0051	0.0048
Gasoline Motorcycles (Non-Catalyst)	Non-catalyst Control	0.0672	0.0069
Gasoline Motorcycles (Uncontrolled)	Uncontrolled	0.0899	0.0087
CNG Light-duty Vehicles		0.737	0.050
CNG Heavy-duty Vehicles		1.966	0.175
CNG Buses		1.966	0.175
LPG Light-duty Vehicles		0.037	0.067
LPG Heavy-duty Vehicles		0.066	0.175
LNG Heavy-duty Vehicles		1.966	0.175
Ethanol Light-duty Vehicles		0.065	0.067
Ethanol Heavy-duty Vehicles		0.197	0.175
Ethanol Buses		0.197	0.175

**Source:**  
US EPA (2008); *Greenhouse Gas Inventory Protocol Core Module Guidance - Direct Emissions from Mobile Combustion Sources*, EPA Climate Leaders, Table 3.

**Table 5 CH<sub>4</sub> and N<sub>2</sub>O Emissions for Non-highway Vehicles**

Vehicle Type	CH <sub>4</sub> Factor (g / gallon)	N <sub>2</sub> O Factor (g / gallon)
LPG Non-Highway Vehicles	0.50	0.22
Residual Oil Ships and Boats	0.86	0.30
Diesel Ships and Boats	0.74	0.26
Gasoline Ships and Boats	0.64	0.22
Diesel Locomotives	0.80	0.26
Gasoline Agricultural Equip.	1.26	0.22
Diesel Agricultural Equip.	1.44	0.26
Gasoline Construction Equip.	0.50	0.22
Diesel Construction Equip.	0.58	0.26
Jet Fuel Aircraft	0.27	0.31
Aviation Gasoline Aircraft	7.04	0.11
Biodiesel Vehicles	0.58	0.26
Other Diesel Sources	0.58	0.26
Other Gasoline Sources	0.50	0.22

**Note:**  
LPG non-highway vehicles assumed equal to other gasoline sources. Biodiesel vehicles assumed equal to other diesel sources.

**Source:**  
US EPA (2008); *Greenhouse Gas Inventory Protocol Core Module Guidance - Direct Emissions from Mobile Combustion Sources*, EPA Climate Leaders, Tables A-6 and A-7.

**Table 6 Refrigerants and Global Warming Potentials (GWPs)**

Gas	GWP
CO <sub>2</sub>	1
CH <sub>4</sub>	21
N <sub>2</sub> O	310
SF <sub>6</sub>	23,900
HFC-23	11,700
HFC-32	650
HFC-125	2,800
HFC-134a	1,300
HFC-143a	3,800
HFC-152a	140
HFC-227ea	2,900
HFC-236fa	6,300
CF <sub>4</sub>	6,500
C <sub>2</sub> F <sub>6</sub>	9,200
C <sub>3</sub> F <sub>8</sub>	7,000
c-C <sub>4</sub> F <sub>8</sub>	8,700
C <sub>4</sub> F <sub>10</sub>	7,000
C <sub>5</sub> F <sub>12</sub>	7,500
C <sub>6</sub> F <sub>14</sub>	7,400

**Source:**  
Intergovernmental Panel on Climate Change (IPCC) (1995); *Second Assessment Report*. Use of the Second Assessment Report on Global Warming Potential values is consistent with current international agreements.

**Table 6b Blended Refrigerants (ASHRAE #)**

ASHRAE #	Blend GWP HFC/PFC	Blend Make-up
R - 401A	18.2	53% HCFC-22 , 34% HCFC-124 , 13% HFC-152a
R - 401B	15.4	61% HCFC-22 , 28% HCFC-124 , 11% HFC-152a
R - 401C	21	33% HCFC-22 , 52% HCFC-124 , 15% HFC-152a
R - 402A	1,680	38% HCFC-22 , 6% HFC-125 , 2% propane
R - 402B	1,064	6% HCFC-22 , 38% HFC-125 , 2% propane
R - 403B	2,730	56% HCFC-22 , 39% PFC-218 , 5% propane
R - 404A	3,260	44% HFC-125 , 4% HFC-134a , 52% HFC 143a
R - 406A	-	55% HCFC-22 , 41% HCFC-142b , 4% isobutane
R - 407A	1,770	20% HFC-32 , 40% HFC-125 , 40% HFC-134a
R - 407B	2,285	10% HFC-32 , 70% HFC-125 , 20% HFC-134a
R - 407C	1,525.5	23% HFC-32 , 25% HFC-125 , 52% HFC-134a
R - 407D	1,427.5	15% HFC-32 , 15% HFC-125 , 70% HFC-134a
R - 407E	1,362.5	25% HFC-32 , 15% HFC-125 , 60% HFC-134a
R - 408A	1,944	47% HCFC-22 , 7% HFC-125 , 46% HFC 143a
R - 409A	-	60% HCFC-22 , 25% HCFC-124 , 15% HCFC-142b
R - 410A	1,725	50% HFC-32 , 50% HFC-125
R - 410B	1,832.5	45% HFC-32 , 55% HFC-125
R - 411A	15.4	87.5% HCFC-22 , 11 HFC-152a , 1.5% propylene
R - 411B	4.2	94% HCFC-22 , 3% HFC-152a , 3% propylene
R - 413A	1,774	88% HFC-134a , 9% PFC-218 , 3% isobutane
R - 414A	-	51% HCFC-22 , 28.5% HCFC-124 , 16.5% HCFC-142b
R - 414B	-	5% HCFC-22 , 39% HCFC-124 , 9.5% HCFC-142b
R - 417A	1,954.8	46.6% HFC-125 , 5% HFC-134a , 3.4% butane
R - 422A	2,532.3	85.1% HFC-125 , 11.5% HFC-134a , 3.4% isobutane
R - 422D	2,232.3	65.1% HFC-125 , 31.5% HFC-134a , 3.4% isobutane
R - 423A	2,060	47.5% HFC-227ea , 52.5% HFC-134a
R - 424A	2,011	Mixture of: HFC-125 , HFC-134a , butane , pentane .
R - 426A	1,349	Mixture of: HFC-125 , HFC-134a , butane , pentane .
R - 428A	2,930	77.5% HFC-125 , 2% HFC-143a , 1.9% isobutane
R - 434A	2,652	Mixture of: HFC-125 , HFC-134a , HFC-143a , GWP
R - 500	36.7	73.8% CFC-12 , 26.2% HFC-152a , 48.8% HCFC-22
R - 502	-	48.8% HCFC-22 , 51.2% CFC-115
R - 504	313.3	48.2% HFC-32 , 51.8% CFC-115
R - 507	3,300	5% HFC-125 , 5% HFC143a
R - 508A	10,175	39% HFC-23 , 61% PFC-116
R - 508B	10,350	46% HFC-23 , 54% PFC-116

**Source:**

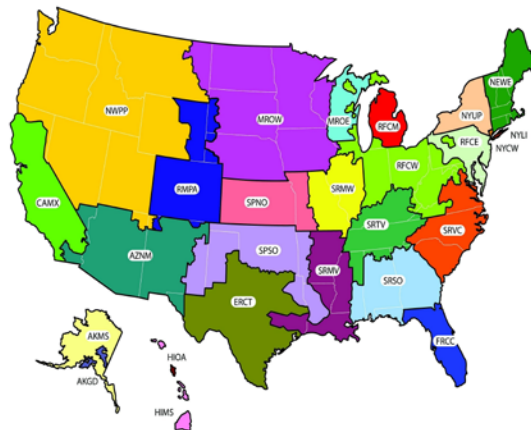
Intergovernmental Panel on Climate Change (IPCC) (1995); *Second Assessment Report*. Use of the Second Assessment Report on Global Warming Potential values is consistent with current international agreements.

The blended refrigerants are based on internet research to determine the constituents, and the GWP is based on the blend of HFC and PFC gases.

**Table 7 Electricity Emission Factors (System Average)**

Subregion	CO <sub>2</sub> Factor (lb CO <sub>2</sub> /MWh)	CH <sub>4</sub> Factor (lb CH <sub>4</sub> /MWh)	N <sub>2</sub> O Factor (lb N <sub>2</sub> O/MWh)
AKGD (ASCC Alaska Grid)	1,284.72	0.02711	0.00744
AKMS (ASCC Miscellaneous)	535.73	0.02265	0.00448
AZNM (WECC Southwest)	1,252.61	0.01880	0.01657
CAMX (WECC California)	681.01	0.02829	0.00623
ERCT (ERCOT All)	1,252.57	0.01776	0.01399
FRCC (FRCC All)	1,220.11	0.04119	0.01525
HIMS (HICC Miscellaneous)	1,343.82	0.13515	0.02171
HIOA (HICC Oahu)	1,620.76	0.09105	0.02089
MROE (MRO East)	1,692.32	0.02879	0.02905
MROW (MRO West)	1,722.67	0.02897	0.02919
NEWE (NPCC New England)	827.95	0.07698	0.01520
NWPP (WECC Northwest)	858.79	0.01634	0.01364
NYCW (NPCC NYC/Westchester)	704.80	0.02622	0.00335
NYLI (NPCC Long Island)	1,418.74	0.09050	0.01310
NYUP (NPCC Upstate NY)	683.27	0.01741	0.00990
RFCE (RFC East)	1,059.32	0.02740	0.01703
RFCM (RFC Michigan)	1,651.11	0.03255	0.02779
RFCW (RFC West)	1,551.52	0.01837	0.02593
RMPPA (WECC Rockies)	1,906.06	0.02363	0.02889
SPNO (SPP North)	1,798.71	0.02122	0.02920
SPSO (SPP South)	1,624.03	0.02452	0.02242
SRMV (SERC Mississippi Valley)	1,004.10	0.02180	0.01115
SRMW (SERC Midwest)	1,779.27	0.02057	0.02960
SRSO (SERC South)	1,495.47	0.02364	0.02457
SRTV (SERC Tennessee Valley)	1,540.85	0.01987	0.02548
SRVC (SERC Virginia/Carolina)	1,118.41	0.02226	0.01908

**Source:**  
 US EPA (2011); eGRID2010 Version 1.1 Year 2007 Data.



This is a representational map; many of the boundaries shown on this map are approximate because they are based on companies; not on strictly geographical boundaries.

**Source:**  
 USEPA eGRID2010 Version 1.0 December 2010.

**Table 7b Electricity Emission Factors (Non-baseload); Used for Green Power / REC Calculations**

Subregion	CO <sub>2</sub> Factor (lb CO <sub>2</sub> /MWh)	CH <sub>4</sub> Factor (lb CH <sub>4</sub> /MWh)	N <sub>2</sub> O Factor (lb N <sub>2</sub> O/MWh)
AKGD (ASCC Alaska Grid)	1,363.19	0.03499	0.00695
AKMS (ASCC Miscellaneous)	1,462.30	0.06168	0.01218
AZNM (WECC Southwest)	1,211.84	0.02056	0.00931
CAMX (WECC California)	1,045.30	0.03942	0.00474
ERCT (ERCOT All)	1,096.19	0.01969	0.00563
FRCC (FRCC All)	1,286.41	0.04340	0.01150
HIMS (HICC Miscellaneous)	1,645.57	0.12294	0.02133
HIOA (HICC Oahu)	1,630.89	0.10618	0.01852
MROE (MRO East)	1,905.18	0.03525	0.02998
MROW (MRO West)	1,988.69	0.05359	0.03298
NEWE (NPCC New England)	1,204.91	0.06069	0.01341
NWPP (WECC Northwest)	1,279.58	0.04331	0.01575
NYCW (NPCC NYC/Westchester)	1,234.06	0.03765	0.00488
NYLI (NPCC Long Island)	1,397.80	0.04408	0.00699
NYUP (NPCC Upstate NY)	1,384.20	0.03155	0.01619
RFCE (RFC East)	1,671.96	0.03329	0.02219
RFCM (RFC Michigan)	1,803.64	0.03209	0.02733
RFCW (RFC West)	1,982.05	0.02430	0.03148
RMPP (WECC Rockies)	1,554.38	0.02317	0.01645
SPNO (SPP North)	1,958.22	0.02540	0.02775
SPSO (SPP South)	1,435.24	0.02503	0.01314
SRMV (SERC Mississippi Valley)	1,171.05	0.02825	0.00691
SRMW (SERC Midwest)	1,945.66	0.02402	0.02969
SRSO (SERC South)	1,551.05	0.02850	0.02169
SRTV (SERC Tennessee Valley)	1,917.25	0.02598	0.03005
SRVC (SERC Virginia/Carolina)	1,661.11	0.03801	0.02451
US Average	1,520.21	0.03223	0.01841

**Sources:**

US EPA (2011); eGRID2010 Version 1.1 Year 2007 Data.

**Table 8 Business Travel Emission Factors**

Vehicle Type	CO <sub>2</sub> Factor (kg / unit)	CH <sub>4</sub> Factor (g / unit)	N <sub>2</sub> O Factor (g / unit)	Units
Passenger Car	0.364	0.031	0.032	vehicle-mile
Light-duty Truck	0.519	0.036	0.047	vehicle-mile
Motorcycle	0.167	0.070	0.007	vehicle-mile
Intercity Rail (i.e. Amtrak)	0.185	0.002	0.001	passenger-mile
Commuter Rail	0.172	0.002	0.001	passenger-mile
Transit Rail (i.e. Subway, Tram)	0.163	0.004	0.002	passenger-mile
Bus	0.107	0.0006	0.0005	passenger-mile
Air Travel - Short Haul (< 300 miles)	0.286	0.0084	0.0091	passenger-mile
Air Travel - Medium Haul (≥ 300 miles, < 2300 miles)	0.168	0.0009	0.0053	passenger-mile
Air Travel - Long Haul (≥ 2300 miles)	0.194	0.0009	0.0061	passenger-mile

**Sources:**

US EPA (2008); *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, Optional Emissions from Employee Commuting, Business Travel and Product Transport.*

Air travel sourced from: Department for Environment Food and Rural Affairs (2011); *2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting, Status Final*; Version 1.0; updated July 7, 2011.

**Table 9 Product Transport Emission Factors**

Vehicle Type	CO <sub>2</sub> Factor	CH <sub>4</sub> Factor	N <sub>2</sub> O Factor	Units
Medium- and Heavy-duty Truck	1.726	0.021	0.017	vehicle-mile
Passenger Car	0.364	0.031	0.032	vehicle-mile
Light-duty Truck	0.519	0.036	0.047	vehicle-mile
Truck	0.297	0.0035	0.0027	ton-mile
Rail	0.0252	0.002	0.0006	ton-mile
Waterborne Craft	0.048	0.0041	0.0014	ton-mile
Aircraft	1.527	0.0417	0.0479	ton-mile

**Sources:**

*Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, Optional Emissions from Employee Commuting, Business Travel and Product Transport (May 2008).*