



Determining Fuel and Energy Source Emission Coefficients

(<http://www.eia.doe.gov/oiaf/1605/coefficients.html>)

CO₂ is created when fuels are burned in combustion. The following factors can be used to determine the CO₂ that is released with various source fuels.

Fuel	Code	Emission Coefficients		
		Pounds CO ₂ per Unit Volume or Mass		Pounds CO ₂ per Million Btu
Petroleum Products				
Aviation Gasoline	AV	18.355	per gallon	152.717
		770.916	per barrel	
Distillate Fuel (No. 1, No. 2, No. 4 Fuel Oil and Diesel)	DF	22.384	per gallon	161.386
		940.109	per barrel	
Jet Fuel	JF	21.095	per gallon	156.258
		885.98	per barrel	
Kerosene	KS	21.537	per gallon	159.535
		904.565	per barrel	
Liquified Petroleum Gases (LPG)	LG	12.805	per gallon	139.039
		537.804	per barrel	
Motor Gasoline	MG	19.564	per gallon	156.425
		822.944	per barrel	
Petroleum Coke	PC	32.397	per gallon	225.130
		1356.461	per barrel	
		6768.667	per short ton	
Residual Fuel (No. 5 and No. 6 Fuel Oil)	RF	26.033	per gallon	173.906
		1,093.384	per barrel	
Natural Gas and Other Gaseous Fuels				
Methane	ME	116.376	per 1000 ft ³	115.258
Landfill Gas	LF	¹	per 1000 ft ³	115.258
Flare Gas	FG	133.759	per 1000 ft ³	120.721
Natural Gas (Pipeline)	NG	120.593	per 1000 ft ³	117.080
Propane	PR	12.669	per gallon	139.178
		532.085	per barrel	



Electricity ** See next page for info	EL	Varies depending on fuel used to generate electricity		
Electricity Generated from Landfill Gas	LE	Varies depending on heat rate of the power generating facility		
Coal				
Coal	CL			
Anthracite	AC	3852.16	per short ton	227.400
Bituminous	BC	4931.30	per short ton	205.300
Subbituminous	SB	3715.90	per short ton	212.700
Lignite	LC	2791.60	per short ton	215.400
Renewable Sources				
Biomass	BM	Varies depending on the composition of the biomass		
Geothermal Energy	GE	0		0
Wind	WN	0		0
Photovoltaic and Solar Thermal	PV	0		0
Hydropower	HY	0		0
Tires/Tire-Derived Fuel	TF	6160	per short ton	189.538
Wood and Wood Waste ²	WW	3812	per short ton	195.0
Municipal Solid Waste ²	MS	1999	per short ton	199.854
Nuclear				
Nuclear	NU	0		0
Other				
Other	ZZ	0		0

1 For a landfill gas coefficient per thousand standard cubic foot, multiply the methane factor by the share of the landfill gas that is methane.

2 These biofuels contain "biogenic" carbon. Under international greenhouse gas accounting methods developed by the Intergovernmental Panel on Climate Change, biogenic carbon is part of the natural carbon balance and it will not add to atmospheric concentrations of carbon dioxide.³ Reporters may wish to use an emission factor of zero for wood, wood waste, and other biomass fuels in which the carbon is entirely biogenic. Municipal solid waste, however, normally contains inorganic materials principally plastics that contain carbon that is not biogenic. The proportion of plastics in municipal solid waste varies considerably depending on climate, season, socio-economic factors, and waste management practices. As a result, EIA does not estimate a non-biogenic carbon dioxide emission factor for municipal solid waste. The U.S. Environmental Protection Agency estimates that, in 1997, municipal solid waste in the United States contained 15.93 percent plastics and the carbon dioxide emission factor for these materials was 5,771 lbs per ton.⁴ Using this information, a proxy for a national average non-biogenic emission factor of 919 lbs carbon dioxide per short ton of municipal solid waste can be derived. This represents 91.9 lbs carbon dioxide per million Btu, assuming



the average energy content of municipal solid waste is 5,000 Btu/lb.

3 Intergovernmental Panel on Climate Change. *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3, Pg. 6.28, (Paris France 1997).

4 U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1998*, EPA 236-R-00-001, Washington, DC, April 2000.

Electricity related CO₂ Emission Factors

The fuels used to create electricity determine the CO₂ emission factor for the electricity of a particular state or region. The average CO₂ emission factor for the US is 1.1 pounds/kWh.

Connecticut and New England use more nuclear power, more oil and gas, and less coal in producing electricity. Our average Emission Factor for electricity is lower because of this.

Average CO₂ Emissions for Electricity in Connecticut are 1.179 pounds/kWh
(http://www.iso-ne.com/genrtion_resrcs/reports/emission/Marginal_Emissions_Analysis_2003.pdf)

Table 1.1: 2003 Marginal Emission Rates (Lbs/MWh)

Emission	On-Peak Ozone Season	Off-Peak Ozone Season	On-Peak Non-Ozone Season	Off-Peak Non-Ozone Season	Annual Average
SO ₂	2.46	0.59	2.26	2.39	1.98
NO _x	0.79	0.29	0.89	0.86	0.73
CO ₂	1,204	974	1,259	1,236	1,179

Table 1.2: 2003 Marginal Emission Rates (Lbs/MBtu)¹

Emission	On-Peak Ozone Season	Off-Peak Ozone Season	On-Peak Non-Ozone Season	Off-Peak Non-Ozone Season	Annual Average
SO ₂	0.30	0.07	0.27	0.29	0.24
NO _x	0.10	0.04	0.11	0.10	0.09
CO ₂	146	118	153	150	143

Feedback on Emissions Factors-:

Share your suggestions to enrich, expand and improve this lesson. How did you use this lesson in your classroom?

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