

Greenhouse Gas Emission Factors For Direct Emission Sources

Stationary Emission Sources

Table 1 provides greenhouse gas (GHG) emission factors for combustion of common fossil fuels at stationary (non-transport) sources.

Table 1 Stationary Emission Sources								
Fuel Type	Metric Tons CO ₂ per Gigajoule	Metric Tons CO ₂ per mmBTU	Metric Tons CO ₂ per Cubic Meter	Metric Tons CO ₂ per 1000 Cubic Feet	Metric Tons CO ₂ per Liter	Metric Tons CO ₂ per Gallon	Metric Tons CO ₂ per Metric Ton Fuel	Metric Tons CO ₂ per Short Ton Fuel
Natural Gas	0.050	0.053	0.002	0.055	-	-	-	-
Propane	0.060	0.063	-	-	0.002	0.006	-	-
LPG	0.060	0.063	-	-	0.002	0.006	-	-
Kerosene	0.069	0.072	-	-	0.003	0.010	-	-
Distillate Fuel (#1, #2, #4 heating oil & Diesel)	0.069	0.073	-	-	0.003	0.010	-	-
Residual Fuel (#5 and #6 heating oil)	0.075	0.079	-	-	0.003	0.012	-	-
Anthracite	0.098	0.103	-	-	-	-	1.930	1.750
Bituminous Coal	0.088	0.093	-	-	-	-	2.470	2.240
Sub-Bituminous Coal	0.091	0.096	-	-	-	-	1.860	1.690
Lignite	0.093	0.098	-	-	-	-	1.400	1.270
Peat	0.101	0.106	-	-	-	-	-	-
Petroleum Coke	0.097	0.102	-	-	0.004	0.015	3.380	3.070

Source: World Resources Institute GHG Calculation Tools for Stationary Emission Sources available at: <http://www.ghgprotocol.org/templates/GHG5/layout.asp?type=p&MenuId=OTAx> prior to October 2006

Note: Emissions based on high heating values where applicable

Mobile Emission Sources

Table 2 provides GHG emission factors for the combustion of common fossil fuels at mobile sources involving road and air transport.

Table 2 Mobile Emission Sources				
Fuel Type	Metric Tons CO₂ per Liter	Metric Tons CO₂ per Gallon	Metric Tons CO₂ per Cubic Meter	Metric Tons CO₂ per Therm
Gasoline	0.0024	0.0092	-	-
Diesel	0.0027	0.0104	-	-
Jet Fuel	-	0.0100	-	-
Aviation Gasoline	0.0024	0.0090	-	-
LPG	0.0016	0.0060	-	-
CNG	-	-	0.0022	0.0054

Source: World Resources Institute GHG Calculation Tools for Stationary Emission Sources available at: <http://www.ghgprotocol.org/templates/GHG5/layout.asp?type=p&MenuId=OTAx>

Greenhouse Gas Emission Factors for Electricity Purchases (Indirect Emissions)

Phase I Electricity Purchase Conversion Factors

During Phase I program years (2003-2006), the conversion factors outlined in the table below will apply. These conversion factors represent the respective average national emissions rates for electricity production during the Phase I CCX Baseline Period (1998-2001).

Table 3 Phase I Purchased Electricity Emission Factors	
Location of Facilities	Metric Tons CO₂ per Purchased Megawatt Hour
United States	0.61
Canada	0.20
Mexico	0.59

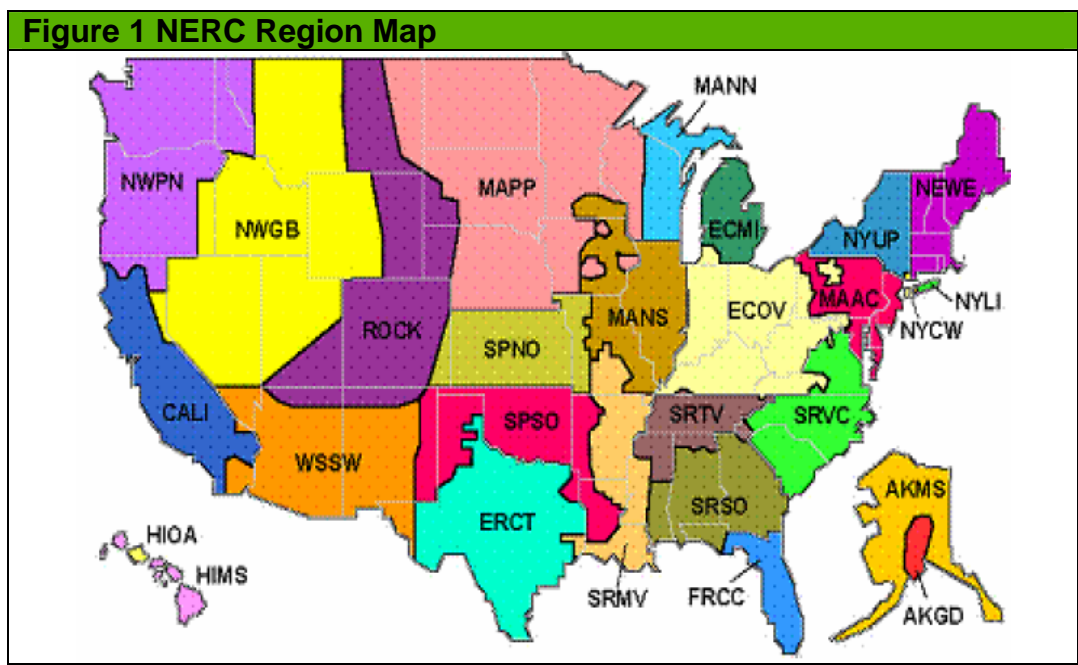
Phase II Electricity Purchase Conversion Factors

During Phase II Members operating within a single region as defined by the National American Electric Reliability Council (NERC), CCX will use the applicable regional conversion factor in determining the CFIs to be allocated based on a Member's annual objective for electricity purchases and the annual CFI requirement for the Committee approved electricity purchases. **See Table 4 and Figure 1 for Phase II regional purchased electricity emission factors.**

For Members operating in multiple NERC regions, CCX will use the applicable national conversion factor in determining the annual CFIs to be allocated based on a Member's annual objective for electricity purchases and the annual CFI requirement for the Committee approved electricity purchases.

Please view Advisory 2007-01 at <http://www.chicagoclimateexchange.com/info/advisories/2007/2007-01.pdf> for additional details.

Table 4 Phase II Purchased Electricity Emission Factors		
NERC Region	NERG sub-regions in the region	Metric Tons CO ₂ per purchased Megawatt Hour
ASCC	All Alaska	0.49
ECAR	ECMI, ECOV	0.82
ARCOT	ERCT	0.64
FRCC	FRCC	0.63
HICC	All Hawaii	0.78
MAAC	MAAC	0.50
MAIN	MANN, MANS	0.68
MAPP	MAPP	0.83
NPCC	NYLI, NYCW, NEWE, NYUP	0.51
SERC	SRMV, SRSO, SRTV, SRVC	0.62
SPP	SPNO, SPSO	0.89
WECC	CALI, NWGB, NWPN, ROCK, WSSW	0.51



General Conversion Factors

Table 5 General Conversion Factors			
Mass			
1 pound (lb)	453.6 grams (g)	0.4536 kilograms (kg)	0.0004536 metric tons (tonne)
1 kilogram (kg)	2.205 pounds (lb)		
1 short ton (ton)	2'000 pounds (lb)	907.2 kilograms (kg)	
1 metric ton	2'205 pounds (lb)	1'000 kilograms (kg)	1.1023 short tons (tons)
Volume			
1 cubic foot (ft ³)	7.4805 gallons (gal)	0.1781 barrel (bbl)	
1 cubic foot (ft ³)	28.32 liters (L)	0.02832 cubic meters (m ³)	
1 gallon (gal)	0.0238 barrel (bbl)	3.785 liters (L)	0.003785 cubic meters (m ³)
1 barrel (bbl)	42 gallons (gal)	158.99 liters (L)	0.1589 cubic meters (m ³)
1 litre (L)	0.001 cubic meters (m ³)	0.2642 gallons (gal)	
1 cubic meter (m ³)	6.2897 barrels (bbl)	264.2 gallons (gal)	1'000 liters (L)
Energy			
1 kilowatt hour (kWh)	3412 Btu (btu)	3'600 kilojoules (KJ)	
1 megajoule (MJ)	0.001 gigajoules (GJ)		
1 gigajoule (GJ)	0.9478 million Btu (million btu)	277.8 kilowatt hours (kWh)	
1 Btu (btu)	1'055 joules (J)		
1 million Btu (million btu)	1.055 gigajoules (GJ)	293 kilowatt hours (kWh)	
1 therm (therm)	100'000 btu	0.1055 gigajoules (GJ)	29.3 kilowatt hours (kWh)
Other			
kilo	1'000		
mega	1'000'000		
giga	1'000'000'000		
tera	1'000'000'000'000		
1 psi	0.06895 bar		
1 kgf / cm ³ (tech atm)	0.9807 bar		
1 atmosphere (atm)	1.01325 bar	101.325 kilo pascals	14.696 pounds per square inch (psia)
1 mile (statue)	1.609 kilometers		
1 metric ton CH ₄	21 metric tons CO ₂ equivalent		
1 metric ton N ₂ O	310 metric tons CO ₂ equivalent		
1 metric ton carbon	3.664 metric tons CO ₂		

Source: World Resources Institute GHG Calculation Tools for Stationary Emission Sources available at: <http://www.ghgprotocol.org/templates/GHG5/layout.asp?type=p&MenuId=OTAx>