

2.1 Fuel combustion

- ☒ Method 1: Calculation Approach
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The list of emission stream types for fuel combustion is based on the type of fuel as defined in the 2006 IPCC Guidelines. If the list of fuel types is not relevant, the facility is allowed to input a user-specified fuel type.

Method 1: Calculation Approach

Based on the 2006 IPCC Guidelines², Method 1: Calculation Approach uses the following formula:

$$E_g = Q_f \times NCV_f \times \sum (EF_{f,g} \times GWP_g) \quad (1)$$

Parameter ID	Parameter description	Units	Reporting status
E _g	Emissions for GHG (g) i.e. CO ₂ , CH ₄ and N ₂ O	tonne CO ₂ e	Calculated
Q _f	Quantity of fuel (f) combusted i.e. total quantity of fuel used for purposes of producing or providing energy	tonne	Reported
NCV _f	Net calorific value of fuel (f)	GJ/tonne	Reported
EF _{f,g}	Emission factor for CO ₂ , CH ₄ and N ₂ O for fuel (f) on a net calorific basis	tonne GHG/GJ	Reported
f	Fuel type (f) being combusted	Nil	Reported
GWP _g	Global warming potential for GHG (g)	Nil	Constant

Q_f, the total quantity of fuel used for purposes of producing or providing energy is also reported in the ECA Energy Use Report (Energy Consumption & Production) for relevant business activities.

If Q_f is measured and reported in terms of (i) Million BTU in HHV (mmBTU) or (ii) Million BTU in LHV (mmBTU) (e.g. Natural Gas), the formula becomes:

$$E_g = Q_f \times F_0 \times \sum (EF_{f,g} \times GWP_g) \quad (2)$$

Parameter ID	Parameter description	Units	Reporting status
E _g	Emissions for GHG (g) i.e. CO ₂ , CH ₄ and N ₂ O	tonne CO ₂ e	Calculated

Q _f	Quantity of fuel (f) combusted	Million BTU in HHV (mmBTU) or Million BTU in LHV (mm BTU)	Reported
F ₀	Conversion factor for mmBTU (HHV or LHV) to GJ	Nil	Constant
EF _{f,g}	Emission factor for CO ₂ , CH ₄ and N ₂ O for fuel (f) on a net calorific basis	tonne GHG/GJ	Reported
f	Fuel type (f) being combusted	Nil	Reported
GWP _f	Global warming potential for GHG (g)	Nil	Constant

The conversion factors for F₀ are as follow:

Source unit	Target unit	Conversion factor, F ₀
Million BTU in HHV (mmBTU)	GJ	1.0550559 * 0.9 (for gaseous fuels e.g. natural gas) 1.0550559 * 0.95 (for solid and liquid fuels e.g. coal and oil)
Million BTU in LHV (mmBTU)	GJ	1.0550559
Other source units available in the EDMA system for reporting ³		
Gigawatt-hour (GWh)	GJ	3600
Million Tonne of Oil Equivalent (Mtoe)	GJ	41868000

According to the 2006 IPCC Guidelines⁴, the net calorific value (NCV) i.e. lower heating value (LHV) is about 5% less than the gross calorific value (GCV) i.e. higher heating value (HHV) for solid and liquid fuels, while for gaseous fuels, the NCV is about 10% less.

Default conversion factors i.e. NCV and emission factors (on a net calorific basis) are available for a list of default fuels as defined in the 2006 IPCC Guidelines. Alternatively, the facility can use site-specific conversion factors which have to be substantiated and approved by NEA.

The facility may perform analysis on the fuel to determine its NCV and carbon content. The following formula shows how the CO₂ emission factor can be computed using the fuel carbon content and NCV:

$$EF_{f,CO_2} = \frac{C_f}{NCV_f} \times \frac{44}{12}$$

Where: EF_{f,CO₂} is the CO₂ emission factor (tonne CO₂/tonne fuel) for the fuel (f)
C_f is the ratio of carbon in the fuel (f) on a tonne carbon/tonne fuel basis
NCV_f is the net calorific value (GJ/tonne fuel) for fuel (f)
 $\frac{44}{12}$ is the molecular weight ratio to convert tonnes of carbon to tonnes of CO₂

³ In the event where activity data is to be reported in these units, the facility may select "Default – convert mmBTU (GCV) to GJ (NCV)" as the data source for "Energy Content" conversion factor in the MP Template in order to automate the uncertainty calculations.

⁴ Refer to the 2006 IPCC Guidelines, Volume 2, Chapter 1, page 1.16 for more details.

² Refer to the 2006 IPCC Guidelines, Volume 2, Chapter 2 for more details.