CO_2 Saving from Fuel Switching

Annual CO_2 before and after switching fuels for the same useful heat, from each fuel's emission factor per GJ and the boiler efficiency on each.

Method: $CO_2 = (Q/\eta) \times$ EF per GJ of fuel (IPCC Guidelines tier 1 approach)

Input parameters

Unit system: SI

Parameter	Value	Unit
Useful heat per year	60,000	GJ
Old fuel emission factor (kg CO_2/GJ of fuel) From your inventory guide (e.g. IPCC defaults: diesel about 74, natural gas about 56, coal 90–100).	74.100	
Efficiency on the old fuel (same CV basis as EF_1)	86.000	%
New fuel emission factor (kg CO_2/GJ)	56.100	
Efficiency on the new fuel (same CV basis as EF_2)	90.000	%

Calculated results

Parameter	Value	Unit
CO_2 on the old fuel	5,169.8	t
CO_2 on the new fuel	3,740.0	t
CO_2 saved per year	1,429.8	t
Reduction	27.656	%

Notes for this case

- Biomass CO_2 is usually reported as biogenic (often counted as zero); follow your reporting rules.

Formula and method

$$m_i = \frac{Q}{\eta_i} EF_i, \quad \Delta m = m_1 - m_2$$

Variables

Q	Useful heat per year	J
EF_1	Old fuel emission factor (kg CO_2/GJ of fuel)	-
η_1	Efficiency on the old fuel (same CV basis as EF_1)	-
EF_2	New fuel emission factor (kg CO_2/GJ)	-
η_2	Efficiency on the new fuel (same CV basis as EF_2)	-
m_1	CO_2 on the old fuel	kg
m_2	CO_2 on the new fuel	kg
Δm	CO_2 saved per year	kg
x	Reduction	-

Method and standards

Emission factor method.

Assumptions and limits

- Same useful heat.
- Each efficiency on the same calorific-value basis as its emission factor (IPCC factors are per GJ of NCV, so use NCV-based efficiencies); mixing GCV and NCV errs by 5–11 %.

References

- CO_2 = (Q/η) × EF per GJ of fuel (IPCC Guidelines tier 1 approach)

Report details

Report reference	FCC-MN6N-BDAA (the same inputs always give the same reference)
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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/carbon-energy/fuel-switching-co2

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.