

Greenhouse Gas intensity of the fuels:				Conversions factors:	
GHG per unit of natural gas:	1937.4 g/m ³	equals	0.05202379 tonnes of CO ₂ equiv per GJ	26.853 m ³ per 1 GJ	
GHG per unit of electricity	9.7 g/kWh	equals	0.00269444 tCO ₂ equiv per GJ	277.7778 kWh per 1 GJ	

Source for NG: [https://unfccc.int/documents/194925-2019 National Inventory Report 1997-2017 Greenhouse Gas Sources and Sinks, Canada's submission to the UN Framework Convention on Climate Change, part 2, page 220-221, table A6-1 and A6-2 \(see conversion below\)](https://unfccc.int/documents/194925-2019-National-Inventory-Report-1997-2017-Greenhouse-Gas-Sources-and-Sinks-Canada-s-submission-to-the-UN-Framework-Convention-on-Climate-Change-part-2)

Source for electricity: [https://unfccc.int/documents/194925-2019 National Inventory Report 1997-2017 Greenhouse Gas Sources and Sinks, Canada's submission to the UN Framework Convention on Climate Change, part 3, page 69, table A13-11](https://unfccc.int/documents/194925-2019-National-Inventory-Report-1997-2017-Greenhouse-Gas-Sources-and-Sinks-Canada-s-submission-to-the-UN-Framework-Convention-on-Climate-Change-part-3)

Energy used by heating systems:	Convert to greenhouse gas emissions:	
54.5 GJ/yr for natural gas furnace with 95% AFUE (tier 1 incentive)	Emissions	2.8353 tCO ₂ equiv/yr
25 GJ/yr for electric air source heat pumps with HPSF 8.5 (tier 1 incentive)	Emissions	0.0674 tCO ₂ equiv/yr
Sources: CIMS model; FortisBC 2016 Annual DSM Report p.17 (for measure life & method)	Difference:	2.7679
A heat pump has 97.62% less greenhouse gas emissions than a high-efficiency natural gas furnace (2.7679/2.8353)		

Advertising standards council has required that we round down rather than up.

this is from natural gas
this is from electricity

Terminology

GHG = Greenhouse gas

tCO₂equiv = The common metric for greenhouse gas emissions is tonnes of CO₂ equivalent. Various emission types (eg N₂O, CH₄) are converted into an equivalent impact to CO₂ based on their Global Warming Potential.

HSPF = Heating Seasonal Performance Factor, this is the efficiency rating used for heat pumps

AFUE = Annual Fuel Utilization Efficiency, this is the efficiency rating system used for gas furnaces

Tier 1 refers to the incentive level offered by the CleanBC Better Homes program. The program only incents high-efficiency models.

Tier 1 is the lowest incentive available. Tier 2 is higher, and available for the highest efficiency products (AFUE 97% for furnaces, and HSPF 9.3 for heat pumps).

To obtain the CO₂equiv for natural gas, the CO₂ equivalent values for N₂O and CH₄ were taken using Global Warming Potentials from <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/quantification-guidance/global-warming-potentials.html>

Conversion factors based on GWP	Results for CO ₂ equivalent of NG, based on residential use
1 kg CH ₄ = 25 kg CO ₂	1926 g/m ³ from CO ₂ (table A6-1)
1 kg N ₂ O = 298 kg CO ₂	0.925 g/m ³ from CH ₄ (table A6-2, converted to CO ₂ e)
	10.43 g/m ³ from N ₂ O (table A6-1 converted to CO ₂ e)
	1937.355 gCO ₂ equiv/m ³

Table A6-2 CH₄ and N₂O Emission Factors for Natural Gas

Source	Emission Factor (g/m ³) ¹	
	CH ₄	N ₂ O
Electric Utilities	0.490	0.049
Industrial	0.037	0.033
Producer Consumption (Non-marketable)	6.4 ²	0.060
Pipelines	1.900	0.050
Cement	0.037	0.034
Manufacturing Industries	0.037	0.033
Residential, Construction, Commercial/Institutional, Agriculture	0.037	0.035

Notes:
1. SGA Energy (2000)
2. Adapted from U.S. EPA (1996b) and CAPP (1999)

Table A6-1 CO₂ Emission Factors for Natural Gas

Province	Emission Factor ¹ (g/m ³)	
	Marketable ²	Non-marketable ³
Newfoundland and Labrador	1 901	2 494
Nova Scotia	1 901	2 494
New Brunswick	1 901	NO
Quebec	1 887	NO
Ontario	1 888	NO
Manitoba	1 886	NO
Saskatchewan	1 829	2 441
Alberta	1 928	2 392
British Columbia	1 926	2 162
Yukon	1 901	2 401
Northwest Territories (prior to 2012) ⁴	2 466	2 466
Northwest Territories (since 2012) ⁴	1 901	2 466

Notes:
NO = Not occurring
1. McCain (2000)
2. The term "marketable" applies to fuel consumed by the Electric Utilities, Manufacturing Industries, Residential, Commercial and Transport subsectors.
3. The term "non-marketable" applies to raw gas consumption, mainly by natural gas producers.
4. Prior to 2012, natural gas consumption was locally produced non-marketable natural gas. Since 2012, marketable natural gas has been imported from outside the territory.

Table A13-11 Electricity Generation and GHG Emission Details for British Columbia¹

	1990	2000	2005	2012	2013	2014	2015	2016	2017 ²
Greenhouse Gas Emissions ³									
kt CO ₂ equivalent									
Combustion	807	1 940	1 330	503	590	571	496	671	568
Coal	--	--	--	--	--	--	--	--	--
Natural Gas	x	x	x	x	x	517	447	628	516
Other Fuels ⁴	x	x	x	x	x	54	50	43	51
Other Emissions⁵	--	2.4	4.6	7.2	6.7	7.4	7.2	6.5	6.5
Overall Total^{6,7}	807	1 940	1 340	510	596	578	504	678	574
Electricity Generation ^{8,9}									
GWh									
Combustion¹⁰	1 390	3 930	3 820	1 510	1 820	1 780	1 610	1 560	1 410
Coal	--	--	--	--	--	--	--	--	--
Natural Gas	1 310	3 350	3 140	712	892	936	788	603	457
Other Fuels	79.4	585	689	798	926	846	818	957	950
Nuclear	--								
Hydro	46 400	50 800	50 300	55 800	50 500	49 000	52 400	56 400	59 100
Other Renewables¹¹	--	--	--	158	152	849	868	1 056	1 015
Other Generation^{12,13}	--	--	--	2 750	2 520	2 240	0	0	0
Overall Total⁷	47 800	54 700	54 100	60 200	55 000	53 900	54 800	59 000	61 500
Greenhouse Gas Intensity ¹⁴									
g GHG / kWh electricity generated									
CO ₂ Intensity (g CO ₂ / kWh)	17	35	24	8.2	10.5	10.4	8.9	11.2	9.0
CH ₄ Intensity (g CH ₄ / kWh)	0.004	0.009	0.007	0.003	0.003	0.003	0.003	0.003	0.003
N ₂ O Intensity (g N ₂ O / kWh)	0.0006	0.001	0.0015	0.0007	0.0009	0.0008	0.0008	0.0008	0.0007
Generation Intensity (g CO₂ eq / kWh)⁷	17	35	25	8.5	11	11	9.2	11	9.3
Unallocated Energy (GWh) ^{15, 16}	2 200	2 300	2 100	900	--	3 700	1 800	1 900	100
SF ₆ Emissions (kt CO ₂ eq) ¹⁷	57	56	48	47	42	26	20	13	19
Consumption Intensity (g CO₂ eq / kWh)¹⁸	19	38	27	9.4	12	12	9.9	12	9.7