

Emission reduction calculators for four technologies

Notes on assumptions and emission factors

June 20, 2023

The following provides the assumptions and other factors used in the calculators embedded in the article [Green house effect: Calculate the savings from electrifying your home](#) published by Corporate Knights in June 2023 online and in the summer issue of the magazine. The article, by Marco Chown Oved and Ralph Torrie, was a coproduction with the Toronto Star where it was also [published online on June 20, 2023](#) and in the Sunday Star on June 25, 2023.

The calculators show the emission reductions and related financial savings from switching to an electric vehicle, to an electric heat pump for space heating, to a DHW heat pump for hot water, and to an induction cooktop. The savings vary by province according to the differing emission factors for grid electricity, differing heat pump efficiencies, and to variations in the prices for fuel and electricity. As such, they do not reflect the factors that vary with each individual household's circumstances and behaviour and are intended only to show the average or typical impact of the switch. The calculators focus on the savings from these technologies; the value of these savings to individuals will vary according to the individual preferences, cost of borrowing, values, health and safety considerations, and many other factors that vary by individual and household.

Common Assumptions

The electricity and gas prices used in the calculator are included in the table below, along with the GHG emission factors for electricity. The greenhouse gas emissions from electricity use are taken from the data for 2020 in Table A-13 in [Canada's National Inventory Report, 1990-2020: Greenhouse Gas Sources and Sinks in Canada](#).

(Note that given the reliance of PEI on electricity from New Brunswick, the New Brunswick emission factor was used for the PEI calculator.)

While the emission factors for Alberta, Saskatchewan and Nova Scotia are expected to decline significantly in the next few years, we did not assume such improvements when estimating the GHG emissions from electricity use in those provinces. Similarly, while the emission factor in Ontario is expected to increase, we did not assume that in our calculations.

The natural gas prices and annual system connection charges are based on information on the web sites of the following distribution utilities: [Eastward Energy for Nova Scotia](#), [Liberty for New Brunswick](#), [Enbridge for Quebec](#), [Enbridge for Ontario](#), [Manitoba Hydro for Manitoba](#), [Sask Energy for Saskatchewan](#), [ATCO for Alberta](#), and [Fortis for B.C.](#)

Common Assumptions Prices (including taxes) and grid emission factors						
	Electricity, cents/kwh	Gas, \$/GJ	Gas, annual connection charge	Gasoline, \$/Litre	Heating oil, \$/Litre	Electricity emission factor, g/kwh
Newfoundland & Labrador	15.9			\$ 1.71	\$ 1.50	25
PEI	19.4			\$ 1.65	\$ 1.50	300
Nova Scotia	21.6	\$ 22	\$ 302	\$ 1.56	\$ 1.50	660
New Brunswick	15.4	\$ 22	\$ 297	\$ 1.63	\$ 1.50	300
Quebec	8.4	\$ 19	\$ 260	\$ 1.65	\$ 1.50	1.9
Ontario	13.5	\$ 19	\$ 325	\$ 1.53	\$ 1.50	28
Manitoba	10.9	\$ 12	\$ 188	\$ 1.66	\$ 1.50	1.2
Saskatchewan	18.7	\$ 10	\$ 309	\$ 1.57	\$ 1.50	620
Alberta	14.5	\$ 10	\$ 326	\$ 1.42	\$ 1.50	640
British Columbia	15.6	\$ 14	\$ 174	\$ 1.79	\$ 1.50	7.8

Electric Vehicle Calculator Assumptions

Assumptions and inputs for EV calculator <i>(See Common Assumptions table for grid intensities, gasoline prices)</i>		
	Gasoline	Electric
Efficiency (L/100 km for ICE, kwh/100 km for EV)	9	20
Maintenance costs in cents per km	8.5	5.1
km travelled per year	15,000	
Emission factor for gasoline, kg CO2 per Litre	2.3	

Induction Cooktop Calculator Assumptions

Assumptions and inputs for Induction cooktop calculator <i>(See Common Assumptions table for gas and electricity prices and grid intensities)</i>				
	Efficiency	Annual consumption in GJ	Annual consumption in natural units	Unit
Gas range	35%	7.7	203	m3
Induction cooktop	90%	3.0	834	kwh
Conventional electric	75%	3.6	1,001	kwh
Annual heat delivered to food, GJ	2.7			

DHW heat pump Calculator Assumptions

Assumptions and inputs for DHW heat pump calculator (See Common Assumptions table for gas and electricity prices & grid intensities)				
	Efficiency	Annual consumption in GJ	Annual consumption in natural units	Unit
Gas water heater	90%	13.1	344	m3
Heat pump water heater	375%	3.1	872	kWh
Electric water heater (resistance)	100%	11.8	3,271	kWh
Oil hot water heater	90%	13.1	344	Litres
Annual demand for DHW heat, GJ per household	10			
Standing losses, all systems	15%			

Air source Heat Pump Calculator Assumptions

Assumptions and inputs for air source heat pump calculator (See Common Assumptions table for fuel and electricity prices and grid intensities)		
	Space heat for typical single family dwelling, GJ/year	Heat Pump Seasonal Coefficient of Performance
Newfoundland & Labrador	70	220%
PEI	75	240%
Nova Scotia	75	260%
New Brunswick	75	230%
Quebec	80	250%
Ontario	80	260%
Manitoba	70	220%
Saskatchewan	75	240%
Alberta	75	240%
British Columbia	60	320%
Other inputs and factors used:		
Gas heating efficiency		90%
Oil heating efficiency		85%
MJ per m3 of natural gas		38.0
MJ per kWh of electricity		3.6
MJ per litre of fuel oil		38
GHG emissions per m3 gas		1,920
GHG emissions per L of oil		2,790