



# HP CARBON FOOTPRINT CALCULATOR FOR HOME AND BUSINESS COMPUTING PRODUCTS

## Key Assumptions

1. The Carbon Footprint Calculator for Home and Business Computing Products generates estimates of energy consumption during use of a computing product, and the user's cost for that electricity. In addition, the calculator estimates emissions of carbon dioxide from production of that electricity and the equivalent amount of miles/kilometers that would need to be driven in an automobile to generate the same amount of carbon dioxide. It is based on certain key assumptions and makes use of data and models generated by third parties described below.
2. The energy consumption calculations for business products are based on established usage pattern assumptions developed by Lawrence Berkeley National Lab (LBL) for the EPA's ENERGY STAR® program, as well as Total Annual Energy Consumption (TEC) formulas found in the [ENERGY STAR® Program Requirements for Computers Specification Version 5.0](http://www.energystar.gov) (<http://www.energystar.gov>). Calculations for business desktops, thin clients, point-of-sale systems, and monitors utilized the conventional desktop usage assumptions in this specification. Calculations for workstations utilized the workstations usage assumptions. Calculations for business notebooks utilized the conventional notebook usage assumptions.
3. The energy consumption calculations for home and home office products are based on formulas and assumptions built into the [EPA's ENERGY STAR Computer Power Management Savings Calculator](http://www.energystar.gov/ia/products/power_mgt/LowCarbonITSavingsCalc_v26_with_5_0v2.xls) ([http://www.energystar.gov/ia/products/power\\_mgt/LowCarbonITSavingsCalc\\_v26\\_with\\_5\\_0v2.xls](http://www.energystar.gov/ia/products/power_mgt/LowCarbonITSavingsCalc_v26_with_5_0v2.xls)).
4. Energy consumption data was measured using test methods established in the [ENERGY STAR® Program Requirements for Computers](http://www.energystar.gov) and [ENERGY STAR® Program Requirements for Displays](http://www.energystar.gov) (<http://www.energystar.gov>). Where configuration options are not offered to the user in the Carbon Footprint Calculator for Home and Business Computing Products, a "typical" component or configuration has been selected. This typical component or configuration represents the highest-volume component or configuration for the product being evaluated.
5. The electricity carbon dioxide equivalent (CO<sub>2</sub>e) factors used in the calculations come from the following sources:

Region	Note
All regions unless otherwise noted below	2008 CO <sub>2</sub> Emissions per kWh from Electricity and Heat Generation. Source: CO <sub>2</sub> Emissions from Fuel Combustion—Highlights. 2010 Edition. International Energy Agency. Available at <a href="http://www.iea.org/co2highlights/co2highlights.pdf">http://www.iea.org/co2highlights/co2highlights.pdf</a> .
Australia	Sources: National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Schedule 1); National Greenhouse Accounts (NGA) Factors, July 2010, Commonwealth of Australia, Department of Climate Change. Available at <a href="http://www.climatechange.gov.au/~media/publications/greenhouse-acctg/national-greenhouse-factors-july-2010-pdf.pdf">http://www.climatechange.gov.au/~media/publications/greenhouse-acctg/national-greenhouse-factors-july-2010-pdf.pdf</a> Overall Australian CO <sub>2</sub> emissions factor a population weighted average.



Canada	Source: Greenhouse Gas Division, Environment Canada, National Inventory Report, Greenhouse Gas Sources and Sinks in Canada— 1990–2005. (Submission to the United Nations Framework Convention on Climate Change), 2007, Tables A9-1 through A9-12.
United Kingdom	Energy Suppliers' Fuel Mix Disclosure from 1 April 2009 to 31 March 2010. Source: Consumer Focus. Available at <a href="http://www.consumerfocus.org.uk/get-advice/energy/households/energy-tariffs-explained/green-tariffs/fuel-mix-disclosure">http://www.consumerfocus.org.uk/get-advice/energy/households/energy-tariffs-explained/green-tariffs/fuel-mix-disclosure</a> .
United States	Year 2007 Data. Source: eGRID2010 Version 1.1 State File, United States of America, Environmental Protection Agency. Available at <a href="http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html">http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html</a> .

6. The carbon dioxide equivalent (CO<sub>2e</sub>) results are for a 100-year global warming potential (GWP) horizon if default emission factors are employed by the user.

7. The currency list and exchange rates used in the calculations are from [http://www.bloomberg.com/markets/currencies/americas\\_currencies.html](http://www.bloomberg.com/markets/currencies/americas_currencies.html) on 12/10/2010.

8. The default electrical costs used in the calculations are for a regional average of industrial sector prices, or commercial prices where available in 2008, except for the U.S. which uses data from 2009. Source: <http://www.eia.doe.gov/emeu/international/elecprti.html>.

9. The equivalent miles driven calculation on the results page is based on a conversion factor for converting lbs CO<sub>2e</sub> to miles:

$(1 \text{ gallon gasoline} / 8.81 \times 10^{-3} \text{ metric tons CO}_2) * (1 \text{ metric ton CO}_2 / 2204.6 \text{ lbs CO}_2) * (19.7 \text{ miles} / 1 \text{ gallon gasoline}) * (.971 \text{ lb CO}_2 / 1 \text{ lb total emissions (as COe)}) = 0.98487 \text{ miles} / \text{lb total emissions (as COe)}$

The following conversion factors for this formula were sourced from the EPA's Greenhouse Gas Equivalencies Calculator:

- $8.81 \times 10^{-3}$  metric tons CO<sub>2</sub> per gallon of gas
- Average vehicle fuel efficiency: 19.7 miles/gallon
- Conversion factor for CO<sub>2</sub> to COe: 0.971

Standard conversions were used to change miles to kilometers.

Links: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html> and <http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles>