

The Bullfrog Power 2007 Ontario Emissions Calculation Methodology

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Bullfrog Power supplies Ontario-based customers with clean power from Ontario-based renewable energy producers. 20% of Bullfrog's electricity comes from wind power producers and 80% from environmentally low-impact water power producers. All of Bullfrog Powers producers are EcoLogo certified by the federal government, and do not emit any CO₂, NO or SO₂ in their production of electricity.

CO₂ is a major greenhouse gas contributing to global warming, and NO and SO₂ are major causes of smog. How much CO₂, NO and SO₂ are we displacing when we choose to buy clean, green electricity from Bullfrog Power in Ontario?

To answer this question, Bullfrog Power has developed an Emissions Calculator with the following goals:

- The data used in the calculator must be publicly available from trusted sources
- The data must be based on the most up-to-date sources available
- The calculations and formulae must be transparent and repeatable by anyone who wishes to verify the calculation
- The assumptions used must be clear and reasonable
- The calculator should not be overly complex or difficult to understand

Bullfrog Power updates this calculator on an annual basis. This document describes the Emissions Calculation used by Bullfrog Power for Ontario customers for purchases made in the calendar year 2007.

Bullfrog Power uses the calculator on its website to educate about emissions avoided by its power producers on behalf of its customers.¹ It also uses the calculator when preparing customers' electricity bills to illustrate CO₂, NO and SO₂ emissions avoided by choosing Bullfrog Power instead of the system mix.

The three steps to building the calculator are:

1. Determine how often each type of electricity (coal, nuclear, oil/gas, water), production was "on the margin" in the system mix, over the most recent 12 month period for which data is available.

¹ Note: "Emissions avoided by Bullfrog's power producers on behalf of its customers" is properly calculated using the "margin" approach followed. For 2008 Bullfrog is considering a switch to "Customer Footprint Emission" reporting, which will be calculated based upon the overall system mix, rather than the production at the margin.

2. For each type of electricity generation, determine the amount of emissions per MWhr of production, using the most recently available annual data.
3. By combining the results of steps 1 and 2, calculate the quantity of emissions avoided for each MWhr of clean power produced and put onto the grid in Ontario by Bullfrog Power's EcoLogo-certified electricity suppliers.

Step 1 – How often is each type of electricity “at the margin”?

Throughout each day, power producers in Ontario bid their power into an auction run by the Independent Electricity System Operator (IESO). The IESO accepts as many bids as required to meet electricity demand at that moment. At any given time, one type of electricity (nuclear, coal, oil/gas, water, etc.) is the last unit of electricity required to meet supply and accordingly sets the market price. The last unit of electricity in the mix is referred to being “at the margin”

The Ontario Energy Board keeps track of which form of electricity is setting the market price and reports that information in its Market Surveillance Report².

Taking monthly percentages from this report, and averaging them out over the most recent year reported, November 2005-October 2006, we calculate³ how often each electricity type was “at the margin”:

Coal	Nuclear	Oil/Gas	Water
65.8%	0.0%	15.3%	19.0%

We now make the assumption that each MWhr produced on Bullfrog Power's customers behalf by Bullfrog's producers, displaces a MWhr created by Coal 65.8% of the time, and a MWhr produced by Oil/Gas 15.3% of the time. Another way to look at this is: If Bullfrog Power's producers *did not* produce this clean power, 65.8% of the deficiency would be made up on the grid by Coal, and 15.3% of the deficiency would be made up by Oil/Gas.

Step 2 – Calculate Emissions/MWhr for each Type of Production

Since Nuclear production was never at the margin over the time period, and Water production has no emissions, we now calculate the emissions/MWhr for Coal and Oil/Gas.

² Available at: http://www.oeb.gov.on.ca/documents/msp/msp_report_final_20061222.pdf, Statistical Appendix, Table A-21

³ To see the calculation, please download the “Bullfrog Emissions Calculator 2007.xls”, available on Bullfrog Power's website.

Coal

Ontario's coal plants are operated by Ontario Power Generation (OPG). OPG's most recent sustainability report⁴ sets out emissions from each of their coal plants and covers the year 2005.

Using the IESO and OPG supplied data, we calculate² that each MWh from Bullfrog Power's producers avoided 0.648 tonnes of CO₂, 2.466 kg of SO₂ and 0.552 kg of NO from coal production in the province.

Oil/Gas

While OPG does report emissions for its Lennox facility, which burns gas and oil, we are not aware of any way to accurately determine the emissions for all of Ontario's various Oil/Gas facilities corresponding to the IESO definition. So to simplify and take a conservative approach, the Bullfrog calculator uses the emission intensity for new combined cycle gas plants, which are more efficient and less polluting than many of the provinces Oil/Gas facilities, including OPG's Lennox plant.⁵

Using the IESO data and the emissions from a new combined cycle gas plant, we calculate² that each MWh from Bullfrog Power's producers avoids 0.056 tonnes of CO₂, 0.003 kg of SO₂ and 0.038 kg of NO.

Step 3 – Calculate Total Emissions/MWhr

By adding the emissions/MWh for both Coal and Oil/Gas, we are able to calculate the total emissions avoided for each MWhr of clean power produced and put onto the grid in Ontario by Bullfrog Power's electricity suppliers.

The results for each MWh of clean power produced by Bullfrog Power's electricity suppliers:

- 0.704 tonnes of CO₂ emissions are avoided
- 2.469 kg of SO₂ emissions are avoided
- 0.590 kg of NO emissions are avoided

The subject of emissions and offset calculations is emerging. If you would like to email comments on this document or the emissions calculator spreadsheet, please send them to info@bullfrogpower.com.

⁴ Available at http://www.opg.com/pdf/SED_05report.pdf, page 36.

⁵ See emissions for Natural Gas Combined Cycle plant from Ontario Clean Air Alliance at: <http://www.cleanair.web.net/resource/fs7-05.pdf>