

THE BULLFROG POWER 2009 MARITIMES EMISSIONS CALCULATION METHODOLOGY

PUBLISHED NOVEMBER 2009

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INTRODUCTION

WHAT IS BULLFROG POWER?

Bullfrog Power is Canada's 100% renewable electricity provider. Bullfrog Power provides a renewable electricity choice to everyone in British Columbia, Alberta, Ontario and the Maritimes. All of Bullfrog Power's producers are certified as low-impact renewable generation facilities under Environment Canada's EcoLogo^M certification program, and do not emit any CO₂, NO or SO₂ in their generation of electricity.

Bullfrog Power injects as much renewable electricity into the electricity grid in the Maritimes as its customers use. Bullfrog purchases all the environmental attributes¹ associated with each megawatt hour (MWh) of renewable electricity that is injected, and retires those environmental attributes, on behalf of its customers. Bullfrog Power is audited on an annual basis to ensure that it purchases and retires at least as much as it sells. The audits are available to the public on Bullfrog Power's website.

WHY HAS BULLFROG POWER DEVELOPED THIS CALCULATOR?

Conventional electricity production is among the largest industrial sources of CO₂, a primary greenhouse gas and major contributor to climate change. Electricity production is also a major source of pollutants such as NO and SO₂ that contribute to poor air quality and are precursors of smog conditions and in jurisdictions that rely on nuclear as a source of their electricity generation there exists radioactive waste, a highly toxic, long-lasting material that must be safeguarded for thousands of years.

Many of Bullfrog Power's customers are curious to understand how their becoming bullfrogpowered affects their environmental footprint. Bullfrog Power maintains this calculator to illustrate emission reductions that can be imputed to each MWh of renewable electricity, and the associated environmental attributes that are retired on behalf of Bullfrog Power customers.

Bullfrog Power publishes the calculator on its website to help educate about the emissions produced when generating conventional electricity in the region. Bullfrog also uses the calculator when preparing customers' electricity bills to illustrate avoided emissions/waste that result from the generation of renewable electricity.

METHODOLOGY GOALS

¹Environmental Attributes represent the general environmental benefits resulting from the generation of renewable low-impact electricity including, among other things, the displacement of non-renewable fuels, the reduction of air emissions, and the reduction of impacts on aquatic, riparian and terrestrial ecosystems. These benefits are transacted in the form of Green Electricity Certificates, sometimes referred to as Renewable Energy Certificates.

Design goals for this calculator include:

1. **TRUSTED SOURCES:** Data used in the calculator must be publicly available from trusted sources.
2. **UP TO DATE:** At the beginning of each calendar year, Bullfrog Power will update the calculator to use the latest data.
3. **TRANSPARENT AND REPEATABLE:** The calculations and formulae must be transparent and repeatable by anyone who wishes to verify the calculation.
4. **REASONABLE ASSUMPTIONS:** The assumptions used must be clear and reasonable.
5. **UNDERSTANDABLE:** The calculator should not be overly complex or difficult to understand.

STEPS IN DETERMINING YOUR EMISSIONS FOOTPRINT

Companies seeking to calculate their emission footprint (also known as their emissions inventory) should follow the Greenhouse Gas Protocol (Corporate Standard)². Individuals can apply the same methodology in order to calculate their personal emissions inventory.

The GHG Protocol identifies three categories of emissions. Direct emissions from facilities that are owned or controlled by the company are known as Scope 1 emissions. Indirect emissions resulting from a company's use of electricity, which are generally emitted at the facilities of third party generators, are known as Scope 2 emissions. All other indirect emissions (e.g. airplane and rental car emissions) related to a company's operations are known as Scope 3 emissions.

The GHG Protocol identifies how companies should calculate their emissions in each Scope. For the purposes of calculating Scope 2 (electricity) emissions, the GHG Protocol adopts an emissions factor-based methodology. This methodology estimates "GHG emissions by multiplying a level of activity (e.g., kwh of electricity consumed by a facility) by an emission factor (e.g. grams of CO2 per kwh)."³ For the purposes of calculating Scope 2 emissions, renewable power generating facilities are treated as having a zero emissions factor.⁴

²The Greenhouse Gas (GHG) Protocol Corporate Standard provides standards and guidance for companies and other organizations preparing a GHG emissions inventory, <http://www.ghgprotocol.org/standards/corporate-standard>

³ "Indirect CO2 emissions from the Consumption of Purchased Electricity, Heat, and/or Steam", p. 3 (registration required to access calculation tools), http://www.ghgprotocol.org/calculation-tools/downloads/downloads-registration?referred_from=/downloads/calcs/ElectricityHeatSteamPurchase_guidance1.2.pdf/

⁴ See "National Inventory Report 1990-2006" Annex 9, p505 Environment Canada http://www.ec.gc.ca/pdb/ghg/inventory_report/2006_report/2006_report_e.pdf

Many individuals and companies, though, do not calculate their emissions inventory, and are simply looking for an estimation of the emissions reduction imputable to their purchase from Bullfrog Power. The Bullfrog Power calculator is designed for this purpose.

FOOTPRINT VERSUS SYSTEM

There are several ways to look at the emissions reductions imputable to one MWh of clean, renewable power. The calculation is not straightforward because the electricity mix and the associated emissions factors vary with, among other things, the season, time of day, and energy source. Bullfrog Power provides estimates based on two leading methodologies.

Bullfrog Power calculates and reports the “Footprint Reduction”. Footprint reduction is an estimate of the emission produced by an average MWh of production in the region. Since individuals and companies generally calculate their emissions footprint using the average emissions intensity of electricity in their region, the Footprint Reduction is generally also the appropriate estimate of emissions reductions for an individual or company.

In some other Provinces, Bullfrog Power also reports the “System Reduction”. System reduction is an estimate of the emissions that *would have been produced* by the overall electricity system, if the MWh of clean renewable power *had not been produced*. The System Reduction is calculated by estimating the emissions produced by a MWh of generation at the margin of the local electricity system (the last unit of power produced at any given time). Unfortunately, generation at the margin data is not publicly available for the Maritimes and so we are unable to provide a System Reduction calculation for Maritime customers.

WHAT PUBLIC INFORMATION IS AVAILABLE?

Ideally there would be a trusted public source of information which clearly and transparently reported intensity of emissions per MWh of electricity consumed in the Maritimes, taking into account both electricity imports and exports. Unfortunately, to our knowledge, this information is not available directly today. Instead we draw data as best we can from public sources, and transparently show the calculations on this data to arrive at our calculator.

The public sources used by the calculator include:

1. **STATISTICS CANADA.** Statistics Canada Manufacturing and Energy Division publishes an annual report indicating the total electricity generation by source and by Province including import and export data. We use the Statistics Canada data to determine the total electricity consumption in the Province.
2. **NATIONAL ENERGY BOARD (NEB).** NEB reports monthly statistics on Electricity Exports and Imports. We use the NEB report to determine the sources of US imports into the Maritimes by State.
3. **NB POWER.** NB Hydro publishes on an annual basis the CO₂e, SO₂, NO emission and low and Intermediate Level Radioactive Waste intensity from its fossil fuel electricity generation facilities.
4. **HYDRO QUEBEC.** Hydro Quebec publishes on an annual basis the CO₂e, SO₂, NO_x emission intensity from its fossil fuel electricity generation facilities.
5. **EPA EMISSIONS & GENERATION RESOURCE INTEGRATED DATABASE (EGRID).** The EPA also publishes a comprehensive inventory of environmental attributes of all the US electric power systems by State. We use this data to determine the emissions intensity of the electricity being imported in the Maritimes.

WHY ARE THE CALCULATIONS ONLY ESTIMATES?

While electricity consumption and production is metered very accurately, many assumptions are necessary in order to develop the calculator. Assumptions include:

- Generalization about the timing of renewable power generation;
- Assumptions about how the grid operates or is managed, including which fuels are displaced when renewable electricity is generated;
- Assumptions about changes from year to year. The current year calculator is derived from historical data, some of which may be many months or even years old;
- Assumptions about how emissions intensity varies by resource type. For example, the emission intensity for the electricity produced by Industry owned facilities in the Maritimes is assumed to be identical to the utility owned facility emission intensities.

As a result, the emissions reductions attributable to one MWh of clean renewable power should be treated as estimates.

OVERVIEW OF THE MICROSOFT EXCEL SPREADSHEET

The *Bullfrog Maritimes Emissions Calculator 2009.xls* file may be downloaded from the Bullfrog Power website.

The spreadsheet has four tabs across the bottom.

The “Summary” tab shows the calculated emissions intensity for the current years and highlights the calculators’ conversion and equivalent measurements.

The “Electricity Generation” tab shows the total electricity consumption in the Maritime provinces from which we source power, taking into account electricity exports and imports, and provides a detailed breakdown of US electricity imports by State.

The “Emission by Resource Type” tab shows how the emissions are calculated for each MWh of generation for each of the generation sources.

The “Footprint Calculator” tabs build on the emissions by resource type to develop the Footprint emission reduction estimates.

EMISSIONS INTENSITY BY RESOURCE TYPE:

PEI THERMAL GENERATION

Stats Canada reports the fuel source of PEI's thermal generation plants, which is almost entirely wood. As a result we assume thermal generation intensity in PEI is nil.

NEW BRUNSWICK THERMAL AND NUCLEAR GENERATION

NB Power reports CO₂e, NO, SO₂ emission and Low and Intermediate Level Radioactive Waste intensity for all of its fossil fuel and nuclear generating facilities.

INTER-PROVINCIAL INTENSITY

Quebec Hydro reports CO₂e, NO, SO₂ emission and Low and Intermediate Level Radioactive Waste intensity for all of its fossil fuel and nuclear generating facilities.

US IMPORT INTENSITY

The EPA Emissions & Generation Resource Integrated Database (eGRID) reports provide emission data on a state-by-state basis. Bullfrog was unable to source any information regarding the emissions intensity of the imports into the Maritime provinces, and we therefore used the average emissions intensities in each state exporting into the Maritime Provinces.

If the electricity being imported is coming from the US during production periods in which coal or other fossil fuels are on the margin (the last forms of generation being called upon for electricity) then the average intensity rates are likely under reporting the emissions. If the electricity being imported is being generated during production periods in which a cleaner source of electricity is on the margin then the intensity rates could be over reported.

FOOTPRINT CALCULATION

The footprint calculation is simply an estimate of the emissions produced by an average MWh of electricity consumed in the Maritimes based on the source of Bullfrog Power's supply mix.

The calculator determines the total electricity consumption in the Maritime provinces. We make the assumption that exports are a representative sample of the overall electricity mix and deduct the exported volume on a pro-rata basis for each generation source. By then including imports from both other Provinces and US imports we are able to determine the total electricity consumed in the Maritime provinces in which we source electricity by generation source.

The percentage contribution by resource type is then multiplied by the emissions intensity for that resource type developed in the previous step.

CONCLUSION AND FURTHER INFORMATION

Bullfrog Power is interested in your feedback on the methodology and the calculator. Please email your comments to info@bullfrogpower.com