

MassDEP  
Bureau of Waste Prevention

**Final 2008 Greenhouse Gas (GHG) Emission Factors to be used by Retail  
Sellers of Electricity Reporting under 310 CMR 7.71(9)  
“Reporting Requirements for Retail Sellers of Electricity”**

Regulatory Authority:  
M.G.L. Chapter 111, Sections 142A through 142E  
and Chapter 21N, Section 2(a)

December 2010

## **Introduction**

This document and the attached spreadsheet explain:

- the final greenhouse gas (GHG) emission factors (EFs) to be used by retail sellers for reporting GHG emissions associated with the electricity they sold in 2008;
- the corrections made to the draft 2008 EFs; and
- the deadlines for mandatory retail seller submittals.

The posting of this document and the attached spreadsheet on the website of the Massachusetts Department of Environmental Protection (MassDEP) triggers a 30 day reporting period, ending at 5 pm on January 21, 2011. By that deadline, all retail sellers that sold electricity in Massachusetts during 2008 must submit the relevant information using BWP AQ 32 “Mandatory Greenhouse Gas Emissions Reporting Form and Spreadsheet for Retail Sellers of Electricity.” Please see the AQ 32 Form and Spreadsheet and their instructions at <http://www.mass.gov/dep/air/approvals/aqforms.htm#ghg> for more details.

Form AQ 32 submittals must be sent to Sue Ann Richardson at [sue.ann.richardson@state.ma.us](mailto:sue.ann.richardson@state.ma.us) and MassDEP, One Winter Street, 6<sup>th</sup> Floor, Boston, MA 02108 by the 5 pm January 21, 2011 deadline.

## **Background**

For background on “Determining Annual GHG Emissions,” an explanation of the “Initial and Annual Reporting Years” and information on the “Methodology and Data Sources” used to calculate the draft GHG EFs, please see the Technical Support Document and Appendix A: Data and Calculations published in July 2010 at <http://www.mass.gov/dep/air/climate/reporting.htm#rse>.

## **Reporting Annual GHG Emissions**

The annual GHG report shall be submitted to MassDEP by each retail seller using BWP AQ 32, “Mandatory Greenhouse Gas Emissions Reporting Form and Spreadsheet for Retail Sellers of Electricity.” The report shall include a completed spreadsheet using the form provided by MassDEP showing the calculations required under 310 CMR 7.71(9)(c). Since the EFs are expected to change annually as the quantity and sources of electricity imported into and generated within Massachusetts change, an updated AQ 32 Spreadsheet will be posted each year on the MassDEP website when final EFs have been determined.

The spreadsheet provided by MassDEP as part of BWP AQ 32, “Mandatory Greenhouse Gas Emissions Reporting Form and Spreadsheet for Retail Sellers of Electricity,” simplifies reporting for retail sellers. Competitive suppliers and electric utilities must report the total megawatt hours (MWh) they report to the Massachusetts Department of Energy Resources (DOER) under its Renewable Portfolio Standard (RPS) regulation. Municipal electric departments and municipal light boards must report the total MWh they report to the Massachusetts Department of Public Utilities (DPU). Retail sellers who choose the simplest reporting approach (i.e., who did not submit optional Form AQ 31 adjusting for ownership and/or use of particular generation sources), need only enter the total MWh, and the spreadsheet will calculate the associated GHG emissions, with no further information required. (Please note that the spreadsheet will calculate Massachusetts-based and Regional GHG emissions.)

Retail sellers who chose to make adjustments for ownership and/or use of non-emitting or emitting MWh on optional Form AQ 31 must also make adjustments for those MWh on the AQ 32 Spreadsheet as follows.

- Retail sellers making adjustments for the use of non-emitting MWh, must enter the same quantity of non-emitting MWh as was submitted on Form AQ 31, and the spreadsheet will calculate the total GHG emissions.

- Retail sellers making adjustments for the use of emitting MWh, must enter the same quantity of emitting MWh as was submitted on Form AQ 31, and the same quantity of GHG emissions associated with the emitting MWh as was submitted on Form AQ 31, and the spreadsheet will calculate the total GHG emissions.

**GHG EFs for 2008**

Table 1A contains the draft GHG EFs for 2008 that were published in August 2010 and on which MassDEP sought public comment. Table 1B shows the corrected EFs for 2008 prior to accounting for optional AQ 31 submittals for ownership and/or use of particular generation sources. Table 1C contains the final GHG EFs for 2008 that were calculated from the corrected EFs and the MWh submitted on AQ 31 Forms. The combined EFs shown in the tables below are provided for information only and are not to be used in the reporting of emissions by retail sellers. The EFs are presented in units of pounds of carbon dioxide equivalents<sup>1</sup> per megawatt hour, or lb CO<sub>2</sub>e/MWh). The EFs shown in Table 1C have been adjusted to account for generation that retail sellers chose to include on optional reporting Form AQ 31. The department recommends that anyone choosing to use the EFs presented in this document for purposes other than retail seller reporting should use the Corrected GHG EFs for 2008 shown in Table 1B, not the adjusted EFs in Table 1C. Note that the Department has also developed and posted 2006 and 2007 emission factors using the procedures laid out in this document for use by the public; retail sellers are not required to submit GHG emissions for 2006 or 2007.

Table 1A. Draft GHG Emission Factors for Electricity Consumed in Massachusetts in 2008

<b>lb CO<sub>2</sub>e/MWh</b>	<b>Massachusetts-based approach</b>	<b>Regional approach</b>
Non-Biogenic	855	718
Biogenic	97	142
Combined	952	860

Table 1B. Corrected GHG Emission Factors for Electricity Consumed in Massachusetts in 2008, prior to accounting for optional AQ 31 submittals for ownership and/or use of particular generation sources

<b>lb CO<sub>2</sub>e/MWh</b>	<b>Massachusetts-based approach</b>	<b>Regional approach</b>
Non-Biogenic	854	700
Biogenic	97	139
Combined	951	839

Table 1C. Final GHG Emission Factors for Electricity Consumed in Massachusetts in 2008, after accounting for optional AQ 31 submittals for ownership and/or use of particular generation sources

<b>lb CO<sub>2</sub>e/MWh</b>	<b>Massachusetts-based approach</b>	<b>Regional approach</b>
Non-Biogenic	871	708
Biogenic	98	141
Combined	970	849

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<sup>1</sup> Not all GHGs have the same heat-trapping capacity. For example, one pound of methane is equivalent to greater than 20 pounds of CO<sub>2</sub> with respect to their heat trapping potentials. To account for these differences, a standard relating the heat trapping potential of each GHG to an equivalent quantity of CO<sub>2</sub> over a given time horizon, has been developed. Emissions shown in this document utilize this standard, and are expressed in units of pounds of carbon dioxide equivalent (CO<sub>2</sub>e).

### **Corrected GHG EFs for 2008**

MassDEP received no comments on the methodology and data sources for the draft 2008 GHG EFs (see footnote 3 for one comment that was received regarding an inconsistency in the regulation). However, several errors were discovered in the Appendix A: Data and Calculations spreadsheet that required correction. The edits made to the various spreadsheet tabs are as follows:

1. *'EPA Part 75 Data' Tab - CO<sub>2</sub> emissions.* Two cogeneration facilities' (Androscoggin and Bucksport) Part 75 CO<sub>2</sub> emissions had been used, inappropriately including CO<sub>2</sub> emissions due to production of steam in this determination of electrical energy EFs. These facilities' United States Department of Energy's Energy Information Administration (EIA) heat input data has been used instead to determine CO<sub>2</sub> emissions, as EIA reports steam and electricity separately. Two facilities (West Springfield and Devon) were found to have small units that do not report Part 75 CO<sub>2</sub> emissions, so their EIA heat input data has been used instead to determine the facilities' CO<sub>2</sub> emissions.
2. *'Form 923 Fuel Generation and Fuel Data' Tab.* Edits were made on this tab corresponding to the edits made above for Part 75 data. In addition, EIA heat input data has been used to determine CO<sub>2</sub> emissions from a small unit at one facility (Merrimack) that had been erroneously treated as reporting CO<sub>2</sub> emissions under Part 75.
3. *'Calculating CO<sub>2</sub>e' Tab* - The units in the label for 'Environment Canada Electricity Generation' (Column F) were corrected to gigawatt hours (GWh) and the units in the label for 'Statistics Canada Electricity Generation' (Column G) were corrected to MWh.
4. *'Corrected and Final EFs' Tab* – A correction was made to the label of Column J so that it now reads 'MA Fraction of Imports' instead of 'MA Fraction of Intra-NE Imports.' Corrections were also made to the following three formulas in the spreadsheet where errors were found: the equation for Biogenic CO<sub>2</sub> emissions in Maine's 'GHG Emissions from Electricity (lb)' (Column AB) was corrected to include the multiplier from the 'ISO Gen % of Total ME Generation' (Row 7 in the 'Adjustment for Northern Maine' table) to match the calculation of Non-Biogenic GHG emissions; the equation for the 'GHG Emissions from Exports (lb)' from Quebec (Column CI) was corrected to include the sum of Non-Biogenic and Biogenic MWh from Quebec on the 'Calculating CO<sub>2</sub>e' tab in the denominator of the calculation of Biogenic CO<sub>2</sub> to match the calculation of Non-Biogenic CO<sub>2</sub> emissions from Quebec; and the equations for the non-biogenic and biogenic emissions in 'Greenhouse Gas Emissions from Exports (lb)' from NY (Column BW) were corrected to remove an inappropriate divisor of 1000.

The spreadsheet in Appendix A: Revised 2008 Data and Calculations contains the data and calculations used to calculate the corrected 2008 EFs.

### Final GHG EFs for 2008

Nineteen retail sellers submitted BWP AQ 31 forms to MassDEP accounting for the ownership and/or use of particular generation sources totaling 1,477,504 non-emitting MWh.<sup>2</sup> No forms including emitting MWh were submitted.<sup>3</sup> Table 2 shows the breakdown of the non-emitting 2008 generation submitted on AQ 31 Forms by fuel type.

Table 2. Non-Emitting 2008 Generation submitted on AQ 31 Forms by Fuel Type

Fuel Type	MWh	%
Hydro	418,238	28%
Nuclear	801,263	54%
Photo Voltaic	94	<1%
Wind	257,909	17%
TOTAL	1,477,504	

Calculation of the final GHG EFs for 2008 can be found on the ‘Corrected and Final EFs’ tab of the Appendix A: Revised 2008 Data and Calculations spreadsheet.

#### *‘Corrected and Final EFs’ Tab –*

A “Non-emitting MWh From AQ 31 Form Submittals for 2008” table was added to show the total amount of non-emitting MWh submitted on AQ 31 Forms, by state/province in which the MWh were generated.

The following adjustments were made to the draft corrected EFs to account for Form AQ 31 submissions for 2008 in the calculation of the final GHG EFs for 2008:

1. Some non-emitting MWh submitted on AQ 31 Forms were from behind-the-meter non-ISO New England-tracked generators in MA that are not included in the data on the ‘ISO load-generation-imports’ tab and therefore were not included in the calculation of either the draft EFs or the corrected EFs. To account for these MWh and allow the retail seller(s) to claim them, these MWh were added to the amount of MWh in ‘MA Electric Generation’ (Column D). This increased the amount of MWh generated by MA and thus reduced the amount of MWh MA needed to import to meet its load in ‘MA Electricity Imports [Gen-Load]’ (Column H).
2. Some non-emitting MWh submitted on AQ 31 Forms were from generators in CT and NY. However, CT and NY were not net electricity exporters in 2008 so no MWh from CT or NY were included in the amount of MWh imported into MA in the draft EFs. To account for these MWh and allow the retail seller(s) to claim them, these MWh were subtracted from the amount in ‘MA Electricity Imports [Gen-Load]’ (Column H). This reduced the amount of MWh required by MA from the net exporting

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<sup>2</sup> One retail seller stated that they have more non-emitting MWh than reported on Form AQ 31, but because they had not known about this regulation in 2008, they had not arranged to have the associated certificates transferred to their subaccount, as required by the regulation. MassDEP has the MWh information supplied by the retail seller, and will keep it in mind when analyzing retail sellers GHG emissions, but cannot determine what each retail seller might have done had the regulation been in place in the past. The optional reporting step has provided stakeholders with valuable information, and we expect this mandatory reporting step will increase our collective knowledge of GHG emissions reporting.

<sup>3</sup> One retail seller pointed out that the regulation is inconsistent in its requirements, allowing non-emitting RPS-eligible MWh to be claimed on Form AQ 31 if the associated certificates are retired in their subaccount, while only allowing emitting RPS-eligible MWh to be claimed on Form AQ 31 if the retail seller also holds a contract for the power. MassDEP is considering a correction to the regulation to address this comment.

states/provinces and therefore the percentage of the imported power that went to MA in ‘MA Fraction of Imports’ (Column J).

3. Finally, all of the non-emitting MWh submitted on AQ 31 Forms were subtracted from the denominator of the calculation of each of the final ‘MA-Based GHG Emission Rates’ (Column T) and ‘Regional GHG Emission Rates’ (Column CT) for 2008, to determine the final 2008 EFs by which each retail seller will multiply MWh sold and not claimed on an AQ 31 Form.

The spreadsheet in Appendix A: Revised 2008 Data and Calculations contains the data and calculations used to calculate the final GHG EFs for 2008. Table 3 below summarizes the changes made to information found on each tab of the spreadsheet in Appendix A: Revised 2008 Data and Calculations.

Table 3. Changes made to information on each tab of the Appendix A: Revised 2008 Data and Calculations spreadsheet to calculate corrected and final 2008 Emission Factors

<b>Tab</b>	<b>Changes</b>
1 “Form 923 Generation and Fuel Data”	Corrections to use Form 923 heat input data for several facilities where EPA Part 75 CO <sub>2</sub> emissions data were previously used, or no CO <sub>2</sub> emissions were calculated.
2 “EPA Part 75 data”	Corrections corresponding to tab 1 so that EPA Part 75 CO <sub>2</sub> emissions data were no longer used for certain facilities.
3 “Electric Power Annual Table A3”	No changes.
4 “IPCC Guidelines Table 2.2”	No changes.
5 “Calculating CO <sub>2</sub> e”	Corrections to labeling of data.
6 “ISO load-generation-imports”	No changes.
7 “Corrected and Final EFs” (tab name changed from “draft Emission Factors”)	Corrections to labeling of MA Fraction of Imports and to the equations for ME’s Biogenic emissions, Non-Biogenic GHG Emissions from Exports from Quebec, and Non-Biogenic and Biogenic GHG Emissions from Exports from NY. Added calculation of MA-Based and Regional combined draft GHG EFs. Added summary tables of the non-emitting MWh submitted on AQ 31 Forms and the EFs. Added calculation of the Final EFs, accounting for the non-emitting MWh from non-ISO New England MA generators in MA Generation, from CT and NY in MA Imports, and from all Form AQ 31 non-emitting MWh in the MA-Based and Regional EFs.

### **Deadlines**

In order to finalize the annual biogenic and non-biogenic EFs, the regulation at 310 CMR 7.71(9)(b)3. requires MassDEP to:

- a. post draft annual EFs, including methodologies and data sources, on its website for public comment for 30 days and notify retail sellers of the posting and of the deadline for submittal of public comment; and,
- b. post final annual EFs, including methodologies and data sources, on its website and notify retail sellers of the posting.

This document and the attached spreadsheet have been posted as part of complying with step “b” of these requirements. MassDEP has also sent notice of the posting of the final EFs to the most recent e-mail address it has for each retail seller. If you are a retail seller and you did not receive this information directly from MassDEP, please provide your contact information to Sue Ann Richardson at [sue.ann.richardon@state.ma.us](mailto:sue.ann.richardon@state.ma.us).

All retail sellers must report 2008 GHG emissions by submitting BWP AQ 32, “Mandatory Greenhouse Gas Emissions Reporting Form and Spreadsheet for Retail Sellers of Electricity,” within 30 days after the final EFs are posted on MassDEP’s website. The AQ 32 Form and Spreadsheet are being posted on the MassDEP website at the same time as this document, which contains the final EFs. The final GHG EFs for Electricity Consumed in Massachusetts in 2008 have been incorporated into the AQ 32 Spreadsheet that is to be used by retail sellers to calculate their 2008 GHG emissions for reporting on the AQ 32 Form.

The deadlines for retail sellers to submit the AQ 32 Form and Spreadsheet are summarized in Table 4 below. Retail sellers can find BWP AQ 32, “Mandatory Greenhouse Gas Emissions Reporting Form and Spreadsheet for Retail Sellers of Electricity” on the MassDEP website at <http://www.mass.gov/dep/air/approvals/aqforms.htm#ghg>. These mandatory retail seller submittals are to be submitted as specified in the Introduction above.

Note that certain deadlines for future annual submittals are different than the deadlines that apply for emissions released in 2008.

Table 4. Deadlines associated with mandatory retail seller GHG reporting

<b>Year MWh generated and emissions released</b>	<b>Mandatory AQ 32 Form and Spreadsheet submittal deadline</b>
2008	30 days after final EFs are posted on MassDEP’s website
2009	Not required
2010 and beyond	The first day of the next month that is a full calendar month after MassDEP posts the final annual EFs on its website. For 2010 emissions, this deadline will likely be in spring 2012.

Appendix A: Revised 2008 Data and Calculations.