2018 GHG Emission Reporting Methodology
QuadReal Property Group

Contents

1. Background

QuadReal Property Group (QuadReal) tracks utility use across their portfolio, including office, retail, residential and industrial assets.

Energy Profiles Limited (EPL) prepared energy and emissions reporting for bcIMC properties previously managed by Bentall Kennedy in past years, summarizing progress in reducing energy / emissions across the overall property portfolio. Starting with the 2016 reporting year, EPL prepared emission reporting for QuadReal's full portfolio, including properties previously managed by GWL and RealStar, vs. a 2007 base year.

There are two goals for this exercise:

1. To determine the energy / emissions for the portfolio following the guidance of the GHG Protocol[i], the industry standard for corporate disclosure purposes.
2. To understand the portfolio's performance vs. historical years, normalized to remove the impact of outside influences such as changes to weather and occupancy, and exceptional tenant loads.

This document details the methodology used to derive the greenhouse gas (GHG) emissions reported by QuadReal for the 2018 emission reporting year.

2. Operational Boundaries

Operational boundaries define the parts of the operation, or 'activities', for which emissions will be reported. Emissions are reported for energy and water consumed and waste generated across QuadReal's Canadian portfolio.

Scope 1, 2 and 3 emissions resulting from the operation of properties are reported, as follows:

Scope 1 Emissions

Scope 1 emissions are direct emissions that originate at properties. These include natural gas and fuel oil consumption for space heating, water heating and, in some cases, cooking. Emissions resulting from refrigerants used on-site are outside of the reporting scope.

Scope 2 Emissions

Scope 2 emissions are indirect emissions from purchased electricity, steam and chilled water that is consumed at properties, but generated elsewhere. Emissions from submetered tenant consumption are outside of QuadReal's organizational boundary, as discussed in Section 3, and are therefore not included as Scope 2 emissions.

Scope 3 Emissions

Scope 3 emissions are reported for water consumption, waste generation, and tenant submetered energy consumption at properties. While submetered tenant consumption is outside of the organizational boundary, it is reported as Scope 3 (other indirect emissions) for completeness and comparability of overall emissions to historical years where submeter-based billing was not present.

3. Organizational Boundaries

Organizational boundaries define the approach to determining ownership or control over the energy and emissions reported for the property portfolio.

Control Approach

The operational control approach has been selected for the purposes of reporting QuadReal's emissions, defined as follows in the GHG Protocol.

> *A company has operational control over an operation if the former or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation…. Under the operational control approach, a company accounts for 100% of emissions from operations over which it or one of its subsidiaries has operational control. It should be emphasized that having operational control does not mean that a company necessarily has authority to make all decisions concerning an operation….*

In other words, emissions are reported for properties and operations where QuadReal is responsible for managing utility consumption.

Determining Responsibility for Emissions

The responsibility for emissions from utility consumption is that of the party responsible for paying the utility costs.

In general, utility accounts billed to QuadReal are defined to be within the operational control boundary since QuadReal has the authority to introduce operating polices as they relate to these accounts. Utility accounts paid directly by the tenant are outside of QuadReal's operational control.

One exception is 'pass-through' utility accounts. Typically, these accounts exist at industrial properties or buildings with triple-net leases where the owner / property manager pays the utility bills but has no influence over utility use or building systems. In these cases, QuadReal does not have the authority to introduce operating policies as they relate to the account, so they are treated as if the tenant were billed directly by the utility company.

Submetered Consumption

Submetered energy use billed to tenants by QuadReal is outside of QuadReal's organizational boundary, as recommended by REALPAC[ii]:

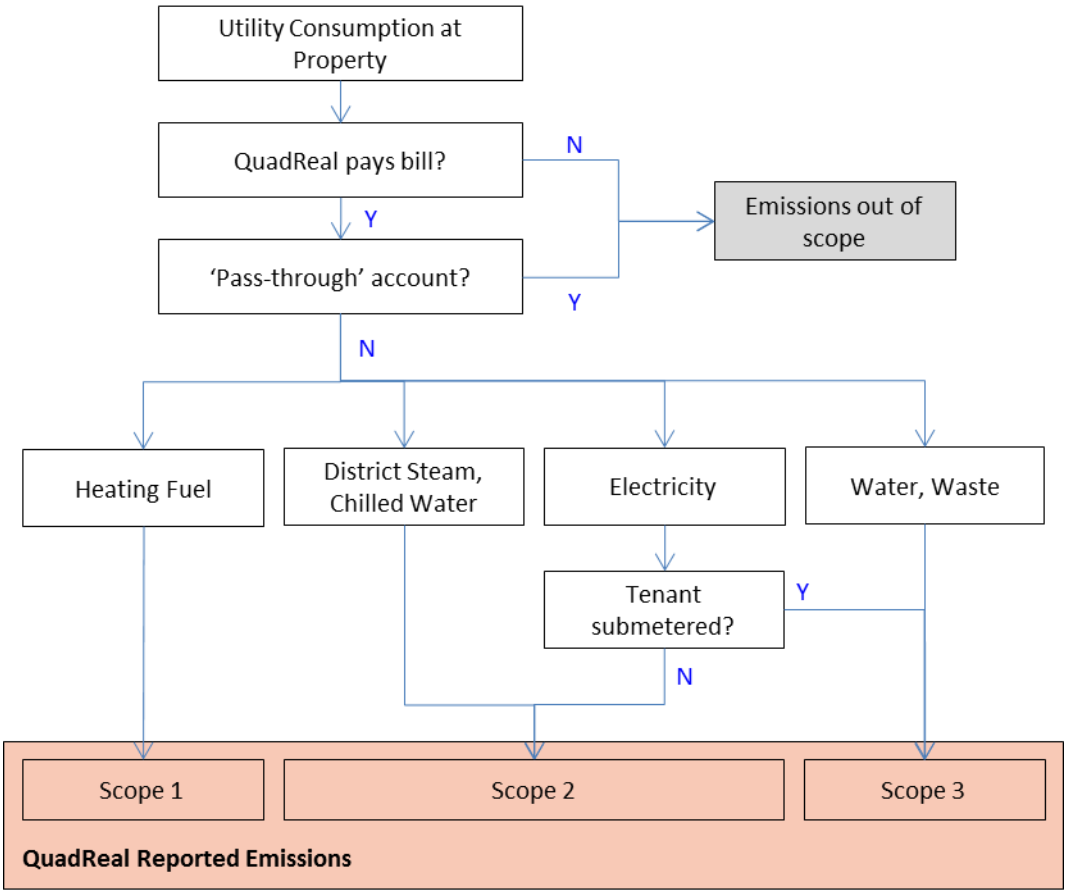
> *Where sub-metering of tenants occurs, the party that is directly responsible for the utility costs is a reasonable method for determining control. For instance, if an owner installed electrical sub-metering for each tenant, and the tenants were responsible for payment of the electricity consumed, then it is far less likely that the owner is responsible for any associated emissions…*

Emissions from submetered energy use are however reported as Scope 3 emissions, as discussed in Section 2.

4. Application of Boundaries

The boundaries defined above are applied to utility consumption based on the following decision tree.

Emissions Scope Decision Tree



5. Comparison to Historical Years

For comparative purposes, 2007 was selected as the base year, as it is the first year for which data is substantially complete. Energy and emissions are trended from 2007-2018.

Base Year Recalculation Policy

Energy and emissions are recalculated for the Base Year and each historical year, in keeping with the GHG Protocol, to account for the following factors:

1. Property acquisitions and divestments by QuadReal/bcIMC.
2. Properties or accounts owned in the base year, but previously excluded from scope.
3. Corrections to historical data based on availability of more accurate information.
4. Changes to reporting methodology.

In cases where historical data is not available, historical consumption is estimated based on the best data available. The base year is not recalculated to account for new property developments or demolitions.

Adjustments for acquisitions / divestments are treated using the 'Same-year, Pro-rata'[iii] approach, meaning that buildings only owned for a portion of the reporting year (2018) are included in all historical years for the same period. Utility use, waste, emissions, and 'effective' gross leasable area are all adjusted proportionately for the period of ownership in 2018.

Treatment of Scope 2 Emission Factors in Historical Years

Canada

Electricity emission factors vary over time as the generation mix throughout Canada changes. Environment Canada publishes a 'National Inventory Report' (NIR) each year. The 2018 NIR, used in the preparation of this emission report, contains annual electricity emission factors reflecting the electricity generation mix in each year from 2000-2016. Emissions could be calculated in two ways:

Method 1: Using the 2018 NIR annual emission factors for the corresponding year for each year prior to 2016, and the 2016 emission factors to report 2016-2018 emissions

Method 2: Using the 2016 emission factors for all years

This is an important issue, as the difference in provincial emission factors can vary by 60% year-over-year. There is no specific guidance in the GHG Protocol as to which approach should be used.

An international survey of other available standards and industry practices in addition to an informal survey of local industry experts suggests that a best practice has not emerged in this regard. Specific guidance is limited to that from climate registries, whose objectives are markedly different from that of an independent corporate entity such as QuadReal.

QuadReal has opted to use Method 1 for the purposes of the corporate reporting.

6. Treatment of Waste

Properties previously managed by Bentall Kennedy began reporting emissions generated from waste in January 2008. 2007 waste data is assumed to be equal to that of 2008. Emissions are reported for trash that is sent to landfill only. No emissions are reported for recycled or composted waste.

Properties previously managed by GWL and RealStar tracked waste data in some cases, starting at different times. The data provided by QuadReal was reported as received with missing months estimated based on available data from the applicable property. This data is excluded from normalized results (see Section 9) as the source of data could not be confirmed.

Emission reductions occur at some properties that send trash to Waste-to-Energy (WTE) facilities where it is used to generate electricity.

To conservatively estimate emissions from trash sent to WTE facilities, it was assumed that 10% of the material sent to WTE facilities still ends up in landfill.

Emissions are calculated using the following formulas for properties that send trash to WTE facilities:

Landfilled trash =	trash weight produced by site – 0.9 * trash weight sent to WTE facility
Emissions =	landfilled trash * waste emission factor

Emissions produced from power production at WTE facilities are not included in this report on the basis that the trash is used as a fuel source, as opposed to being wasted. Analogously, a natural gas producer would not report emissions from the combustion of fuel at generating stations to which it sells fuel. Emissions from the combustion of waste at WTE facilities would be accounted for in the electricity emission factor for the region in which the power is generated.

7. Renewable Energy Credits and Carbon Offsets

Renewable Energy Credits and Carbon Offsets are two distinct mechanisms used to reduce GHG emissions. This section details how each is handled with respect to emission reporting.

Renewable Energy Credits

Renewable Energy Credits (RECs) represent the rights to the environmental benefits from generating electricity from renewable sources. RECs are purchased for some properties in the QuadReal portfolio and are reported using the Market-based Approach, as discussed below.

Market-based Approach vs. Location-based Approach

In January 2015, the World Resource Institute published the GHG Protocol Scope 2 Guidance[iv], defining two approaches to emission reporting and specifying that emissions should be reported using both approaches (dual reporting), effective as of the 2015 reporting year.

- The location-based approach reflects the average emissions intensity of grids on which energy consumption occurs and does not account for REC purchases or any other contractual instruments.
- The market-based approach reflects the emissions from electricity that QuadReal properties have chosen to purchase via contractual instruments. This approach does account for REC purchases.

In light of this guidance, both location-based and market-based emissions are reported for QuadReal's portfolio. Base Year and historical year market-based emissions have been calculated based on the GHG Scope 2 Guidance, as per the Base Year Recalculation Policy detailed in Section 5.

Quality Criteria

The GHG Protocol Scope 2 Guidance, discussed in Section 7.1, sets out 8 'Quality Criteria' for the inclusion of contractual instruments, such as RECs, in market-based accounting.

RECs purchased in 2016-2018 and accounted for in the reporting year are Green-e certified and specify 100% wind power. Green-e has stated publicly that their certified RECs meet the Quality Criteria requirements[v]. RECs purchased for QuadReal properties before 2016 do not meet the Quality Criteria as they do not convey the direct GHG emission rate attribute associated with the unit of electricity produced, and are therefore excluded from reporting.

Volume Allocation

REC contracts typically specify the volume of RECs purchased in one of two ways:

1. As a percentage of a building's electricity consumption.
2. As a fixed amount, approximating a percentage of the building's total electricity (or in some cases total energy) use over a specified number of years.

In cases where a fixed volume of RECs are purchased, there are often no start and end dates associated with the agreements; the contracts confirm only the amount of renewable energy that will be delivered to the grid and a number of years for which the contract applies. In these cases, it has been assumed that the contracted renewable energy volume was delivered to the grid linearly over the specified number of years, starting at the date the contract was executed.

In cases where RECs cover common area and tenant electricity use at a property, RECs are first applied to the common area consumption and the remainder are applied to tenant consumption (Scope 3).

Market-based emissions calculations

Market-based emissions are calculated as follows, in accordance to the GHG Protocol Scope 2 Guidance:

1. Electricity consumption at a property for which RECs are purchased is reported as having zero emissions, given that all RECs reported are from 100% wind generation sources.
2. For all other electricity consumed at a property, emissions are calculated using the appropriate regional emission factor.[vi]
3. In cases where RECs are purchased for more than 100% of a property's electricity consumption, emissions from electricity are reported as zero (i.e. negative emissions are not reported).

Carbon Offsets

Carbon Offsets, or Verified Emissions Reductions, are direct reductions in GHG emissions that can be purchased to 'offset' property emissions. Unlike RECs, Carbon Offsets are purchased in units of 'tonnes of CO_2 equivalent' (tCO_2e) and are not related to electricity purchased or consumed at a property. Carbon Offsets are purchased for some properties in the portfolio to offset Scope 1 emissions. Offsets are subtracted from the

total location-based and market-based emissions to report 'Net location-based' and 'Net market-based' emissions.

8. Utility Data Estimation

There are two situations in which utility data is estimated:

1. Properties where utility data is tracked but some bills (recent or historical) are missing.
2. Properties that are within the reporting boundary, but utility data is not tracked.

Missing Utility Bills

Data Gaps

Best efforts are made to collect actual utility consumption from utility bills or utility meters for all properties/accounts. When gaps exist in verifiable utility data, consumption is estimated based on a linear regression of available utility data and actual weather data. In the case of non-weather dependent accounts, historical consumption is assumed to be equal to recent year consumption.

Baseline Consumption

Where verifiable utility data is not available for the 2007 base year, the earliest available consecutive 12 months of billed consumption is assumed for 2007 through to the earliest available bill.

Energy/emissions data from 2007-2016 is not available for the industrial properties previously managed by GWL. Historical usage is therefore estimated based on 2017 consumption for these properties.

'Not Tracked' Properties

For some properties within the reporting scope, utility data is not available for reporting. In these cases, where QuadReal-paid utility accounts are known to exist, consumption is estimated based on the average energy use intensity of a representative sample of properties from the same asset class.

For properties within the reporting scope where there are known to be no QuadReal-paid utility accounts, consumption is set to zero.

Missing Waste Data

Where waste data is incomplete for a given site, missing data is estimated based on available data from the same site. Where waste data was never available for a property, emissions from waste are not reported.

9. Reporting Normalized Results

To understand the change in energy use and emissions intensity excluding the impact of outside influences, a detailed variance analysis is performed to calculate 'normalized' results.

Reporting Periods

This analysis is performed for two reporting periods and corresponding sub-sets of properties:

1. 2018 vs. 2017, for properties managed from for the duration of 2017-2018
2. 2018 vs. 2007, for properties managed from for the duration of 2007-2018

In other words, properties acquired since 2017 and 2007, respectively, are not included in the analyses. New developments, however, are included in normalized results.

The impact of the following factors on energy use and emissions is calculated and subtracted from the results determined per the GHG Protocol:

1. Weather and occupancy
2. Exceptional tenant loads
3. Changing emission factors

Normalization for Weather

2007 and 2017 energy and emissions are normalized to reflect 2018 weather conditions. To do so, linear regression models are developed for 2007 and 2017 consumption for each individual utility account as a function of heating degree hours (for accounts providing heating energy) and cooling degree hours (for accounts providing cooling energy) using hourly weather data from Environment Canada for the closest weather station to each property.

The 2007 and 2017 models are applied to 2018 weather data to calculate, in effect, what consumption in historical years *would have been* had they experienced 2018 weather. The difference between the actual historical year consumption, and the consumption modeled using 2018 weather provides a reasonable estimate of the impact of changes in weather on energy and emissions.

Normalization for Occupancy

2007 and 2017 energy and emissions are normalized to reflect 2018 occupancy levels. It has been assumed that electricity consumption at office and residential properties is the only utility type materially affected by occupancy.

Monthly vacancy data by property is extracted from QuadReal's accounting system where available. A 'gross-up factor' for each year is then calculated by assuming that if vacant space were occupied by a typical tenant, building consumption would increase by 10 kWh/ft^2/year for office properties, and 6,000 kWh/suite/year for residential. The impact of occupancy on energy consumption is determined as the difference between the gross-up factors in 2018 vs. 2007 and 2017, respectively.

Note that portfolio energy use may increase while emissions decrease, or vice versa, depending on the electricity emission factors in the regions where the changes to occupancy occur. For example, a small increase in energy use in Alberta may result in a larger increase in emissions than the decrease in emissions resulting from a large decrease in energy use in Ontario.

Exceptional Tenant Loads

Energy and emissions from submetered tenant data centres are reported under scope 3, as discussed in Section 2. In some cases, data centre energy consumption changes significantly from year to year due to the addition or removal of computer loads.

When reporting normalized results, energy and emissions resulting from submetered data centres are removed, since QuadReal does not influence this energy use. Note that data centres are only removed from the analysis where QuadReal has access to submeter data for the full reporting period (2007 - 2018 or 2017-2018, respectively).

Submetered tenant data centres are identified on a site-by-site basis through communications with property management staff, or in some cases via submeter cost allocation studies. Submeter data is acquired via automated submeter systems or via manual meter readings performed by site staff depending on the property.

Changing Emission Factors

QuadReal's emissions are calculated using year-specific emissions factors (Method 1, as specified in Section 5) for reporting per the GHG Protocol. When reporting normalized results, however, emissions for all years are reported using the 2015 emission factor to remove the impact of changes to the provincial electricity supply mix from the analysis.

10. Emission Factors

Provincial emission factors are published by Environment Canada. The factors used are 2015 values from Canada's Greenhouse Gas Inventory 2000 – 2015, published in 2018. The following table provides the source for each emission factor used.

Emission Factors and Sources - Canada

Electricity

Year	gCO2e/kWh						
	AB	BC	MB	NS	ON	QC	SK
2007	920.0	19.2	13.5	940.0	210.0	3.5	750.0
2008	940.0	28.0	12.0	790.0	170.0	2.5	710.0
2009	880.0	26.0	5.6	820.0	100.0	3.7	800.0
2010	870.0	24.0	2.3	750.0	130.0	2.6	800.0
2011	710.0	14.0	3.5	740.0	96.0	2.3	810.0
2012	790.0	8.5	3.4	700.0	96.0	2.7	830.0
2013	810.0	10.9	3.3	720.0	66.0	2.0	710.0
2014	750.0	10.7	3.6	690.0	39.0	1.4	750.0
2015	810.0	9.2	3.5	690.0	40.0	1.1	690.0
2016-2018	760.0	11.1	1.9	680.0	36.0	1.3	660.0

Source: Canada's Greenhouse Gas Inventory 1990–2016 (NIR 2018).

Natural Gas

Year	gCO2e/m3						
	AB	BC	MB	NS	ON	QC	SK
2007-2016	1,939.4	1,937.4	1,897.4	1,912.4	1,899.4	1,898.4	1,840.4

Source: Canada's Greenhouse Gas Inventory 1990–2016.

Water

Year	gCO2e/m3						
	AB	BC	MB	NS	ON	QC	SK
2007	1,173.9	24.5	17.2	1,199.4	268.0	4.5	957.0
2008	1,199.4	35.7	15.3	1,008.0	216.9	3.2	906.0
2009	1,122.9	33.2	7.1	1,046.3	127.6	4.7	1,020.8
2010	1,110.1	30.6	2.9	957.0	165.9	3.3	1,020.8
2011	906.0	17.9	4.5	944.2	122.5	2.9	1,033.6
2012	1,008.0	10.8	4.3	893.2	122.5	3.4	1,059.1
2013	1,033.6	13.9	4.2	918.7	84.2	2.6	906.0
2014	957.0	13.7	4.6	880.4	49.8	1.8	957.0
2015	1,033.6	11.7	4.5	880.4	51.0	1.4	880.4
2016-2018	969.8	14.2	2.4	867.7	45.9	1.7	842.2

Source: Maas, Carol. Greenhouse Gas and Energy Co-Benefits of Water Conservation. POLIS Project on Ecological Governance, University of Victoria, March 2009. 2018 electricity factors from Canada's Greenhouse Gas Inventory 1990–2016.

Trash

Year	gCO2e/kg						
	AB	BC	MB	NS	ON	QC	SK
2007	1,848.2	1,668.5	1,939.4	1,590.0	2,086.8	2,038.8	2,154.6
2008	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2009	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2010	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2011	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2012	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2013	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2014	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2015	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7
2016-2018	2,216.7	1,821.7	1,987.0	1,467.0	2,055.0	2,100.0	1,890.7

Source: Canada's Greenhouse Gas Inventory 1990–2016. Assumes 200 years of waste emissions.

Deep Lake Water Cooling (ON)

Year	gCO2e/ton-h
	ON
2007	65.7
2008	57.6
2009	43.5
2010	49.6
2011	56.6
2012	61.7
2013	41.6
2014	20.7
2015	40.7
2016	40.6
2017	40.5
2018	50.2

Source: 2018 EPL Enwave Study, NIR 2018; incl. distribution losses

Steam

Year	gCO2e/lb	
	BC	ON
2007-2011	73.3	71.9
2012	73.3	78.2
2013	73.3	77.3
2014	73.3	80.8
2015	73.3	76.8
2016	73.3	74.3
2017	73.3	73.8
2018	73.3	73.8

Source: ON - 2017 EPL Study of Enwave DLWC and Steam System; BC - Gas factors from NIR 2018. Assume 75% plant efficiency.

Heating Oil

Year	gCO2e/l
	NS
2007-2015	2,762.9

Source: Canada's Greenhouse Gas Inventory 1990–2016.

Hot Water

Year	gCO2e/MWh
	AB
2007-2015	252,941.0

Source: Gas factors from NIR 2018 Table A6-1, A6-2. Assumed 74% plant efficiency

11. Glossary of Terms

Base Year	the earliest year selected for inclusion in reporting for comparative purposes, as per Section 5
Effective GLA	gross leasable area, prorated for the period of ownership in the reporting year. Note that for GRESB/SASB reporting, the GLA is not prorated, as per GRESB reporting rules.
WTE	waste to energy, as described in Section 6.
kWh	kilowatt-hours of electricity
ekWh	equivalent kilowatt-hours (all energy types)
$ekWh/ft^2$	equivalent kilowatt-hours per square foot of Effective GLA
GHG	greenhouse gases, for the purposes of this report: CO_2, CH_4, N_20
CO_2e	carbon dioxide equivalent
gCO_2e	grams of carbon dioxide equivalent
tCO_2e	metric tons of carbon dioxide equivalent
tCO_2e /1,000ft^2	metric tons of carbon dioxide equivalent per 1,000 square feet of Effective GLA

[i] The GHG Protocol – A Corporate Accounting and Reporting Standard (World Resources Institute, 2004)

[ii] Whose Carbon Is It? GHG Emissions and Commercial Real Estate (Real Property Association of Canada, 2010)

[iii] Base year recalculation methodologies for structural changes - Appendix E to the GHG Protocol Corporate Accounting and Reporting Standard – Revised Edition (World Resources Institute, 2005)

[iv] GHG Protocol Scope 2 Guidance – An amendment to the GHG Protocol Corporate Standard (World Resources Institute, 2015)

[v] Green-e Energy Summary of WRI Scope 2 Guidance (Centre for Resource Solutions, 2015)

[vi] As per the GHG Protocol Scope 2 Guidance, *where available*, 'Residual Mix Emission Rates' should be applied to electricity not purchased via contractual instruments (e.g. RECs) to avoid double counting of renewable energy attributes. Green-e has published Residual Mix Emission Rates for North America, however these factors correspond to NERC Regions which are not consistent the more regionally specific and widely accepted provincial factors from Environment Canada. As such, the provincial factors have been used in place of Residual Mix factors for the purposes of this report.